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Science

THE SCIENTISTS NEWSWEEKLY

The Judging Committee and representatives of the Managing Committee, AAAS-George Westinghouse Science Writing Awards, at their meeting in New York, November 20, in which the two $1,000 prizewinners in the 1947 contests were selected (see *News and Notes,* November 28). *Left to right* (seated): Kenneth E. Olson, dean of the Medill School of Journalism, Northwestern University; H. L. Mencken, of the Baltimore *Sun* papers; Morris Meister, chairman of the Judging Committee; Edward Weeks, editor of the *Atlantic;* Edward Weidlein, director, Mellon Institute of Industrial Research; (standing): Robert Potter, Managing Committee; Clifton Fadiman, literary critic; June Armstrong, secretary, Managing Committee; Rudolf Flesch, author of *The art of plain talk;* and Walter R. Miles, chairman, Managing Committee.

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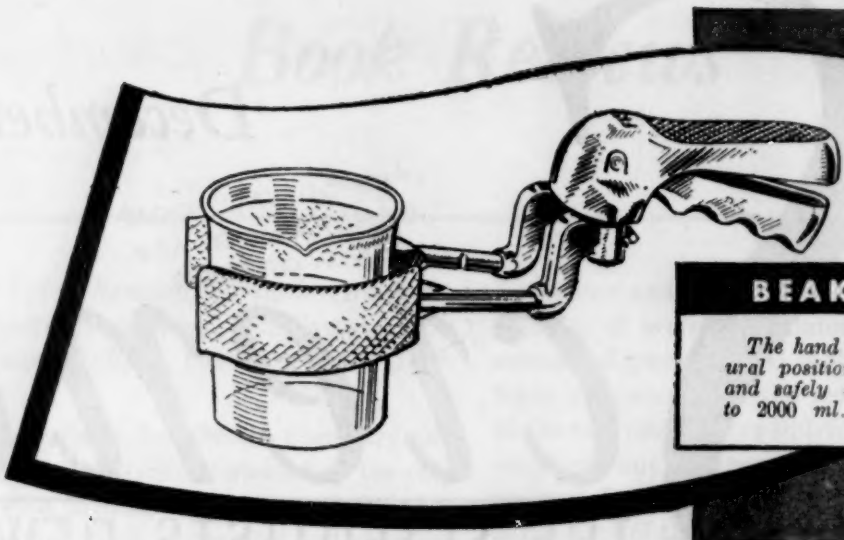
Report of the Inter-Society Committee
for a National Science Foundation



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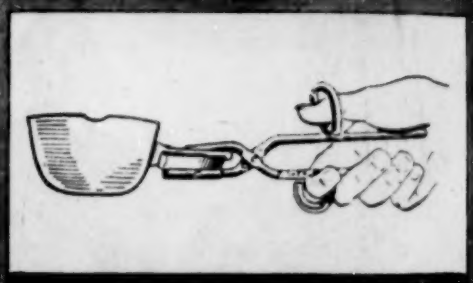

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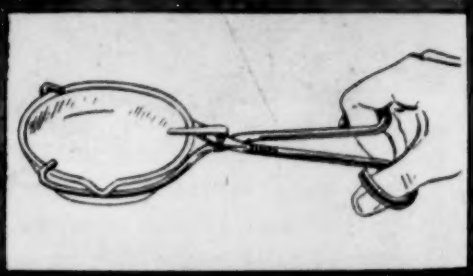

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The Inter-Society Committee for a National Science Foundation: Report for 1947

Dael Wolfle, *Secretary-Treasurer*

THE INTER-SOCIETY COMMITTEE FOR A National Science Foundation was formed to unite scientists in a common front on the attempt to secure a National Science Foundation in 1947. That effort failed. It failed in spite of the fact that Congress, the President, and practically all scientists agreed that a National Science Foundation was necessary. The Foundation was killed by disagreement within the Government over the *kind* of Foundation that was needed.

With nearly unanimous agreement that a National Science Foundation of some type is necessary, scientists will try again to secure the necessary legislation. Before that effort starts, it is time to review the history of the Inter-Society Committee and to ask why its efforts to influence the provisions of the legislation were unsuccessful. It is not necessary here to discuss the relative merits of the specific features of science foundation bills that have been proposed in the last few years; that has been done in a series of articles in *Science* and elsewhere.[1]

The 1946 meeting of the American Association for the Advancement of Science at Boston provided an opportunity for scientists to consider how they should attempt to secure in the 80th Congress the National Science Foundation that the 79th Congress had failed to create. It was generally admitted that the disagreements of scientists themselves during the 79th Congress had contributed somewhat to the failure to secure enactment of S. 1850. The Inter-Society Committee was conceived as a way of preventing the repetition of that error. It grew out of an informal meeting attended by W. P. Anslow, Jr., Joseph C. Boyce, Detlev W. Bronk, Robert Chambers, Karl T. Compton, James B. Conant, Watson Davis, H. Feshbach, William A. Higinbotham, Leo M. Hurvich, M. Stanley Livingston, Kirtley F. Mather, R. Newton Mayall, Fred A. Mettler, Stuart Mudd, Talcott Parsons, Philip N. Powers, Morton D. Schweitzer, Harlow Shapley, Robert M. Yerkes, and Donald Young.

These men decided that the AAAS was the organization most representative of all science and that it should take the initiative in organizing scientists for a united effort to secure a National Science Foundation. The Council of the AAAS accepted these decisions and on December 29 adopted a resolution asking the President of the AAAS to appoint two representatives and to invite the president of each affiliated society to appoint two representatives to the Inter-Society Committee for a National Science Foundation.

Acting quickly on this resolution, President Conant wrote on January 4 to the presidents of all of the organizations affiliated with the AAAS and to a few other national scientific and educational associations, inviting each to name two representatives to the new committee. He asked Kirtley F. Mather, one of the AAAS representatives, to call the first meeting of the committee.

On February 5 Dr. Mather informed the representatives that the first meeting would be held in Washington, D. C., on February 23. At that time no science foundation bills had been introduced into Congress. Several members of Congress, however, were known to be interested in such legislation and were invited to meet with the Inter-Society Committee on February 23. (Senator Elbert Thomas was the only one who accepted. He was present for an hour or so after adjournment of the meeting.)

Two days after the announcement of the committee meeting was made, two bills were introduced into the Senate. S. 525, introduced by Senator Elbert Thomas of Utah, was identical with S. 1850 as the Senate had passed that bill the year before. S. 526, introduced by Senator H. Alexander Smith of New Jersey, and others, was a new bill which was similar in many respects to the amendment to S. 1850 which Senator Smith had proposed in the 79th Congress and similar also to the earlier Magnuson Bill. Shortly afterward, four bills were introduced into the House of Representatives: H. R. 942, which was identical with S. 1850 as it had been reported to the Senate the previous year, and H. R. 1815, H. R. 1830, and H. R. 1834, all three of which were identical with S. 526. Later, H. R. 2027, also identical with S. 526, was introduced. Earlier articles in *Science* have given the content of these bills.

When the Inter-Society Committee met on February 23 it was composed of representatives, usually two each, of approximately 75 organizations which had accepted President Conant's invitation of January 4. They elected an Executive Committee of the following members: chairman, Edmund E. Day, president, Cornell University; vice-chairman, Harlow Shapley, Harvard University; secretary-treasurer, Dael Wolfle, American Psychological Association; members at large of the Executive Committee, Isaiah Bowman, president, Johns Hopkins University; Ralph W. Gerard, University of Chicago; R. G. Gustavson, chancellor, University of Nebraska;

[1] A defense of the President's veto of S. 526 is given by Don K. Price in "The deficiencies of the National Science Foundation Bill" (*Bulletin of the Atomic Scientists*, 1947, **3**, 291–294; 310). A comparison of the bills in the 80th Congress is given by Dael Wolfle in "What kind of Science Foundation shall we have?" (*Journal of Higher Education*, 1947, **18**, 182–188).

Henry Allen Moe, Guggenheim Foundation; W. A. Noyes, University of Rochester; and Douglas M. Whitaker, Stanford University.

The Executive Committee was voted authority to replace any of its own members who were unable to serve.

It was generally agreed by the committee that the bills then before Congress were drafts, that amendments might be made, that the committee should not become too involved at that time in discussions of details, but that it should be interested in the main features of the bills which had been introduced. A discussion of the two Senate bills, S. 525 and S. 526, was therefore called for. John Q. Stewart of Princeton, who was present as an observer, started the discussion, reporting that he had assisted in writing S. 526 and that the basis for that bill was the amendment to S. 1850 which had been proposed by Senator Smith in the 79th Congress. The greatest difference between that bill and S. 525, he pointed out, was that S. 526 called for a large board which would select an executive committee which in turn would select the Director of the Foundation. In contrast, S. 525, like the previous year's S. 1850, authorized the President to appoint the Foundation's Administrator.

After describing differences between the two bills, Prof. Stewart suggested a questionnaire as a guide to the Executive Committee in interpreting the attitudes of committee members. After further discussion, Dr. Mather proposed an off-the-record straw vote on the preferred type of administration. The vote was taken with the following result:

Favoring a single administrator to be appointed by the President	41
Favoring the large-board type of administration suggested in S. 526	22
Favoring administration by a small board such as the Atomic Energy Commission	32
No preference among the three alternatives	18

Straw votes were also taken on two other points on which much discussion had centered: (1) The vote was unanimously in favor of including provision for fellowships and scholarships; all but 18 members were in favor of providing for undergraduate scholarships. (2) All but four were in favor of including the social sciences in the research program of the Foundation.

In closing the meeting, Chairman Day summarized the consensus of the group: Despite their differing opinions on individual features of the bills before Congress, scientists—all of them—had to get together to support the kind of National Science Foundation favored by a majority, for if they failed to agree and failed to make their support unanimous, there might be no Foundation.

After the meeting adjourned, John H. Teeter informed the officers that the House of Representatives Committee on Interstate and Foreign Commerce would hold public hearings on science foundation bills on March 6 and 7. Mr. Teeter assisted the House Committee in arranging these hearings. A few days later the Committee on Interstate and Foreign Commerce invited Chairman Day to testify on March 6.

On March 5 the Executive Committee held its first meeting. Present were Day, Shapley, Wolfle, Gerard, Gustavson, and Whitaker. Isaiah Bowman and W. A. Noyes had been unable to accept their appointments, Dr. Bowman because of the pressure of other duties, Dr. Noyes because of ill health. The Committee had not, at that time, and did not later, receive a reply from Mr. Moe to his invitation to serve.

The Executive Committee considered possible alternates for Bowman and Noyes. It was agreed that Day would discuss with Bowman the selection of a person who had served actively in the group which had the year before formed the *Committee in Support of the Bush Report*. The Executive Committee agreed that a representative of that group was highly desirable. C. G. Suits, vice-president of the General Electric Company, was chosen as a replacement for W. A. Noyes and accepted appointment.

The Executive Committee considered at some length the position it should take and the kind of testimony which Chairman Day should offer on the following day. It interpreted its task as reporting the majority judgment of scientists rather than one of making its own decisions as to what should or should not be included in a science foundation bill. In line with this policy, the Committee decided that for the time being it would not support or criticize the specific points of any bill, but would limit itself to support of those features which were generally agreed upon.

On March 6, Chairman Day testified before the House of Representatives Committee on Interstate and Foreign Commerce. After a description of the Inter-Society Committee, he testified that the foundation bill, whatever its specific provisions, should include the following features:

(1) Provision for the support of fundamental research without reference to questions of immediate practical applications.

(2) Freedom for the Foundation to investigate problems in any scientific area by any appropriate method.

(3) Provision for scholarships and fellowships for the training of young scientists.

(4) Coordination of scientific research conducted by other groups in order that the Foundation should have both the responsibility and the authority to assume leadership in planning ways to meet the country's scientific needs.

In conclusion, Day asked for permission to submit later a statement summarizing the judgment of members of the Inter-Society Committee on specific provisions of the bills. Chairman Wolverton replied that his commit-

tee would very much appreciate receiving such a statement and asked that it be submitted at the earliest possible opportunity.

On March 11 the Executive Committee mailed a questionnaire to all members of the Inter-Society Committee. Questions were included on four points: preferred type of administration; patent provisions; inclusion of the social sciences; and inclusion of undergraduate scholarships. The questions were preceded by a discussion of the issues involved, a statement of the judgment of the Executive Committee on the point in question, and a summary of the views expressed by the witnesses who had testified at the House Committee hearings on March 6 and 7. Air mail return of the questionnaire was requested, since at that time we understood that early action would be taken by the House Committee.

On March 19 replies had been received from 73 per cent of the members of the entire Committee. The results were summarized and presented in a formal report which went to all members of the committees in the Senate and House of Representatives which were considering science foundation bills. Copies were also sent to the authors of those bills.

On the question of preferred type of administration, two-thirds of the members preferred a single administrator. The exact tally was: single administrator appointed by the President, 63 per cent; 48-man foundation provided in S. 526, 18 per cent; small, full-time commission, 18 per cent. These were the preferences. The members, however, in large majority considered the bill as a whole more important than the question of administration, and 86 per cent said that, if necessary to secure passage of a bill, they would be willing to accept any of the three types of administration.

On the question of inclusion of the social sciences, 49 per cent favored specific inclusion in the bill; 48 per cent favored permissive inclusion (allowing the Foundation to support work in the social sciences whenever it saw fit); 2 per cent favored excluding the social sciences.

On the parallel question of what treatment of the social sciences was acceptable, 98 per cent were willing to accept either outright or permissive inclusion; only 37 per cent were willing to accept the bill if the social sciences were definitely excluded.

On the question of undergraduate scholarships, 86 per cent favored inclusion and 14 per cent favored prohibition of undergraduate scholarships.

On the patent question, 94 per cent thought that no special stand should be taken by the Committee. The other 6 per cent believed that we should recommend adoption of the patent provisions contained in S. 525 and H. R. 942 (the S. 1850 provisions).

The major results of this questionnaire were in close agreement with two other surveys, one conducted by the Federation of American Scientists and the other made among California scientists. All three of these polls, although conducted in different ways, with different groups, and at different times, agreed closely in showing that scientists overwhelmingly wanted a science foundation, that a two-to-one majority preferred a single administrator, and that they believed that the social sciences should be included.

The agreement of these three polls, and the fact that the members of the Inter-Society Committee were the chosen representatives on science legislation of over 75 scientific organizations, persuaded the Executive Committee that its report to the Senate and House committees represented the best evidence available on what the majority of scientists in America considered wise in a National Science Foundation.

Yet little attention was paid to that report by either Congressional committee. Congressional leaders appeared to have decided what features should be included in the bill and to have little interest in any views not supporting those decisions. On March 19 I sent to Senator Smith a copy of the report described above. It indicated a two-to-one opposition to the administrative proposals of S. 526. On that same date, Senator Smith wrote me saying that any further consideration of the questioned features of the proposed legislation would be at the risk of not having it considered in the first session of the 80th Congress. The Committee on Labor and Public Welfare therefore held no public hearings. On March 20 it reported favorably S. 526, with one or two minor amendments. Chief of these was cutting the Foundation membership from 48 to 24.

The Executive Committee met again on April 28 with Day, Shapley, Wolfle, Gerard, Suits, and Whitaker present. Gustavson was absent. Homer W. Smith, who had been active in the earlier *Committee in Support of the Bush Report*, met with the Committee.

The most important topic for consideration was the question of whether the Executive Committee should endorse S. 526 as it had been reported out of the Senate committee or should press for amendments which would bring it into closer agreement with the majority wishes of the scientists represented. Decision was left in the hands of the three officers who conferred during the next two days with a number of government representatives. On May 1, Chairman Day wrote Senators Taft and Smith and Representative Wolverton, giving the Committee's endorsement of S. 526 and recommending two amendments: decreasing the size of the Foundation from 24 members to 9, and providing for Presidential appointment of the Director after consultation with the Foundation.

This date, May 1, marked a turning point in the efforts of the Executive Committee. Since February 23 it had been working under the dual mandate of trying to get a National Science Foundation and of trying to get a National Science Foundation that would include the specific features considered desirable by most scientists. Up

until May 1 the Executive Committee kept both objectives in mind and sought on every occasion to secure consideration of amendments to S. 526 which would bring it into better agreement with the majority judgment of scientists. The recommendations contained in the letter of May 1 were frankly compromises. After that date the Executive Committee made no further efforts to secure amendments, but simply endorsed the idea of a Foundation and endorsed the bills passed by Congress.

The recommendation of May 1 that the President appoint the Director was adopted by the Senate. On May 13, Senator Smith replied:

> I have also conferred with the President on this matter and I am working out with Mr. Webb, Director of the Budget, a formula which takes care of this matter and which is in line with your suggestion. I hope that this formula will be approved at an early date so we can go ahead with the Bill.

In Senate debate on May 20, Senator Smith reported that this suggestion had been discussed in a conference with Mr. Webb and Dr. Bush and that later he, Senator Saltonstall, and Mr. Webb had discussed it with President Truman.

On May 14 to 20 the Senate debated S. 526. Debate was led by Senator Smith for the Republican party and Senator Kilgore for the Democratic party. Two important amendments resulted from the debate. Provision similar to that previously included in S. 525 for distribution of part of the funds on a geographical basis was adopted after long debate by a vote of 42 to 40. The compromise allowing the President to appoint the Director, which was proposed in Chairman Day's letter of May 1, was introduced as an amendment by Senators Magnuson and Fulbright. It was supported by Senators Smith and Saltonstall. All four stated that this amendment was frankly a compromise, that individually they did not all like it but that it would probably be acceptable to the President, and that it was probably the only compromise that would be generally acceptable and would make establishment of the Foundation possible. Senator Taft vigorously opposed the amendment. On a roll-call vote it carried by a single vote. S. 526, as amended, then passed by a majority of 79 to 8.

On the following day Senator Smith introduced a motion to reconsider the vote but later withdrew that motion. Senator Taft was quoted by the *New York Times* as saying that he intended to recommend to the leaders of the House that the amendment granting the President power to appoint the Director be removed when the bill came up for House of Representatives consideration.

For the next six weeks it seemed that the House of Representatives Committee on Interstate and Foreign Commerce, which then had the bill, might not report it out in time for action before Congress adjourned in July. On July 7, Representative Wolverton, chairman of the Committee, introduced H. R. 4102, a bill substantially like the original S. 526. It was referred to Mr. Wolverton's committee, which reported it out favorably on July 10. The administrative plan described in H.R. 4102 consisted of a Foundation of 24 members who would elect an executive committee of 9 members which would select the Director of the Foundation. No provision was made for geographical distribution of funds. Both of the significant amendments which had been made in the Senate were therefore missing from the House bill. This bill passed the House of Representatives by a voice vote on July 15.

S. 526, as passed by the Senate, and H.R. 4102, as passed by the House, were then sent to a joint Senate-House of Representatives conference to resolve the differences, of which the two major ones were the type of administration and the question of geographical distribution of a portion of the funds. On both issues the resolution was in favor of the House bill. Both houses passed the compromise measure and thus sent to the President a bill which differed only in minor ways from S. 526 as it had been reported out by the Senate committee on March 20.

The Executive Committee sent President Truman a long telegram urging him to sign the bill. Prof. Shapley was particularly active in this effort and arranged for telegrams to the President from a number of sources recommending his approval. Decision by the Executive Committee to urge this action was taken with some reluctance. Ever since the beginning we had been attempting to secure changes in the bill to make it agree more closely with scientists' wishes. The primary objective of the Inter-Society Committee was to secure a National Science Foundation. The bill on the President's desk was the only possibility. Urging him to sign it was, we felt, necessary to comply with the mandate of the Inter-Society Committee.

The President withheld his approval of the bill. *Science* has already published his reasons for the pocket veto (September 12, p. 237). The insistence by the Congress upon a type of administration which the President and his advisers did not consider workable killed the Science Foundation for 1947.

The Inter-Society Committee failed to accomplish its purpose of having a National Science Foundation created. If there are degrees of failure, it failed even more completely in securing a Foundation with the features which most scientists consider desirable. Why did it fail?

One reason may be that the Executive Committee never engaged in any of the behavior ordinarily called political. It obtained and it presented the majority judgment of the members of the Inter-Society Committee. It laid all its cards on the table from the very beginning by reporting not only majority judgments but also the extent of the majority and the fact that members of the Inter-Society Committee were willing to compromise. That is not a strong bargaining position, but the Execu-

tive Committee never attempted to bargain. Perhaps the honest objectivity of its reports and recommendations was politically naive and tactically bad.

A second reason may lie in an early decision both by the Inter-Society Committee as a whole and by the Executive Committee that they wanted very much to avoid the kind of situation which arose in the 79th Congress. A Senate majority and a majority of scientists had then agreed on S. 1850. Dissenting groups of scientists had agreed to support that bill. A few men prevented its passage by introducing a rival bill and withdrawing their support from S. 1850. In 1947 the picture differed. What had been a minority amendment became a majority bill. The Executive Committee felt that it might have killed that bill by starting a fight. Its real desire for peace may have inhibited stronger action in support of amendments to S. 526.

A third reason may lie in the great weight attached to the advice of a few very prominent scientists. The Congressmen most directly responsible for science legislation appeared to attach much less importance to the views of a two-thirds majority of scientists than they did to those of a few particularly prominent ones. The prestige of a few names was used to support S. 526 and to rebuff any suggestions for change in that bill.

The 80th Congress will reconvene in January. The effort to secure a National Science Foundation should be renewed then. There is now almost unanimous agreement on the necessity of a National Science Foundation. The Senate has twice and the House of Representatives once passed such a bill. The President has repeatedly endorsed it. The Steelman Committee report carries strong arguments in its favor. The great majority of scientists, individually and through their associations, have spoken in its favor. This unanimity of support should be remembered in planning for 1948. The argument is no longer whether we should have a Foundation or not. It is one of what kind of Foundation we should have. It is agreement on the specific features of a Foundation that is now necessary. If scientists are willing and able, without important dissenting individuals or groups, to work for the early enactment of the kind of bill which the majority of scientists consider best, if they are willing to work individually by presenting their case to their own Congressmen, a generally satisfactory National Science Foundation law in 1948 is a strong possibility.

The Inter-Society Committee for a National Science Foundation will meet in the Louis XVI Room of the Sherman Hotel in Chicago at 10:00 A.M. Sunday, December 28.

Obituary

Lorande Loss Woodruff
1879–1947

Lorande Loss Woodruff, Colgate professor of protozoology at Yale University and director of the Osborn Zoological Laboratory, died at his home in New Haven after a long illness on June 23, 1947, in his 68th year. With his passing the Corporation of the Marine Biological Laboratory loses a member of more than 40 years standing and the Board of Trustees one who had served faithfully for 24 years.

Woodruff was born in New York on July 14, 1879, and received his education in his native city, graduating from Columbia University with the A.B. degree in 1901 and the Ph.D. in 1905. Before completing his graduate work he was appointed assistant and later instructor in biology at Williams College, where he remained until he was called to Yale in 1907. There he served successively as instructor, assistant professor, and professor until his death. He became chairman of the Department and director of the Osborn Zoological Laboratory in 1938, but took leave of absence in November 1946 on account of ill health.

His connection with the Marine Biological Laboratory began in 1905, when he attended the summer session as investigator and instructor in the invertebrate course and was elected to membership in the Corporation. Four years later he joined the staff of the course in embryology, of which he remained a member until 1914. During the absence of Dr. Calkins in the summer of 1927 he was in charge of the course in protozoology. Elected to the Board of Trustees in 1923, he served with them until his death, and during the years 1930–32 he was a member of the Executive Committee.

Coming to Yale at a time when a radical reorganization of the instruction in biology was to be undertaken, Woodruff took part from the first in teaching general biology and in 1910 assumed full charge of the general course in Yale College. This he built up into one of the soundest and, at the same time, most popular courses in the University. Through the years thousands of students listened to his masterly lectures, later incorporated in his

textbook, *The foundations of biology*, which has been very widely used and has run through 6 editions.

Woodruff's research was exclusively in the field of unicellular organisms. Beginning with his doctoral dissertation, which was done under the direction of the late Prof. Calkins and published in 1905, he made many contributions to our knowledge of the life history of ciliates, their division rate, nuclear reorganization, and the effect of environmental factors on their life cycle. He is perhaps best known for the famous pedigreed race of *Paramecium aurelia*, which was carried for 8 years with daily isolation of the products of division, thus precluding conjugation and showing that these organisms can reproduce asexually indefinitely without dying out. In the first 8 years over 5,000 generations were obtained, and afterward the culture was carried in a less rigorous manner, though sufficiently carefully to exclude conjugation except possibly between closely related individuals. The culture has now reached more than 24,000 generations without loss of vigor. In the course of this work Woodruff and Erdmann discovered that, corresponding to the rhythms in division rate, the nuclei of the paramecia undergo a reorganization process which they termed 'endomixis' and which they described as a form of nuclear reorganization without syncaryon formation. This stirred up much discussion, and more recently the process has been described by others as autogamy, involving fusion between micronuclei from the same cell.

His research naturally attracted graduate students, and throughout the years many have written their dissertations under his direction and carried his methods to new centers, just as his assistants and students in the course in general biology, many of whom have become teachers, have spread his ideas of the teaching of biology throughout the land.

Woodruff was intensely interested in the history of science. Early in his career at Yale he organized a course in the history of biology which he continued throughout his life. He was a collector of scientific books of historical significance. He published a number of essays and addresses in this field and organized two series of lectures on the history of science under the auspices of Gamma Alpha Fraternity, which were later published in book form under his editorship. A paper on "Baker on the Microscope and the Polype" led to a friendly encounter with a descendant of Trembley, the famous author of the treatise on *Hydra* published in 1744.

Woodruff was chairman of the Division of Biology and Agriculture of the National Research Council in 1928–29. He was a member of many scientific societies, including the National Academy of Sciences, the American Society of Zoologists, of which he was secretary-treasurer in 1907-09 and president in 1942, the American Physiological Society, the American Society of Naturalists (vice-president, 1923), the American Association for the Advancement of Science (Fellow), and others. He was a member of Phi Beta Kappa, Gamma Alpha, and Sigma Xi, having been president of the Yale Chapter of the last in 1915. He lectured on protozoology at four summer sessions of the Mountain Laboratory of the University of Virginia. For two terms of three years each he was an associate editor of the *Journal of Morphology*. In 1935 he received the Townsend Harris medal from the College of the City of New York, where he had been as a student before entering Columbia

For one who was closely associated with Woodruff for nearly 40 years, it is difficult to realize that this intimate relation has been forever broken. The association was one of mutual trust throughout and without serious disagreement. He was always on the side of high standards, which he applied to himself as well as to others. Indeed, this was one of his outstanding qualities, as was his intense loyalty to the institutions he served. He was quiet and reserved, but with a kindliness that meant much to those about him. With all of his reserve he could be deeply moved, and he never recovered from the shock of Mrs. Woodruff's death, which came with such cruel suddenness in March 1946.

The members of the Corporation of the Marine Biological Laboratory desire to record their sorrow over the loss of one of their body, a friend and fellow servant whom they will miss acutely and whose memory they will always cherish.

ROSS G. HARRISON

Yale University

[The above memorial was read at the meeting of the Corporation of the Marine Biological Laboratory, Woods Hole, August 12, 1947.]

Association Affairs

Centennial Meeting of the AAAS, 1948

On September 20, 1848, the American Association for the Advancement of Science was formally established. Next year, by vote of the Executive Committee of the Council, it will celebrate the 100th anniversary of its founding in a meeting to be held in Washington from September 13 to September 17, inclusive.

The centenary of the Association will not be simply an occasion for reviewing its hundred years of achievements; the times call for more serious purposes. The future of civilization appears to depend in large measure on science, and consequently the Association faces much heavier responsibilities to society than it has heretofore anticipated. Clearly, the centennial celebration next year may appropriately pay tribute to our predecessors, but it should also critically examine the present and make plans for an arduous future.

At a meeting a few weeks ago the Executive Committee appointed the following Centennial Policy Committee to draw up general plans for the Association's centenary next year: Harlow Shapley (chairman), E. W. Sinnott, E. U. Condon, Roger Williams, W. M. Stanley, James Gilluly, J. M. Hutzel, and F. R. Moulton. The Committee was instructed to formulate plans for (a) the Centennial Meeting, (b) the Centennial Membership Drive, and (c) the Centennial Fund Campaign. This report will be limited to the first of the three duties imposed upon the Committee.

As a general theme for the Centennial Meeting the Committee chose *One World of Science*, meaning by these words that science is the same throughout the world, irrespective of language, politics, and race, and meaning, also, that this unity in science provides rapidly expanding nuclei of men having mutual understanding, respect and cooperation—the only promising foundation for permanent peace.

In order to make effective plans for carrying out the general policies adopted by the Committee, it was decided to organize three quite distinct types of programs, one type for the mornings, another for the afternoons, and still another for evenings. It will be sufficient to characterize briefly the three kinds of programs, which, because of their nature, make it obviously inadvisable to arrange concurrent sessions for any of the affiliated or associated societies.

At the first evening session on Monday, September 13, 1948, Dr. Harlow Shapley will deliver his address as retiring president of the Association. It is hoped that the President of the United States will be present at this meeting and that he will welcome the Association to Washington and express his appreciation of the contributions scientists are making to human welfare. Other governmental officials of high rank are expected to be present on this occasion, for a justice of the Supreme Court, an ex-president of the United States, a United States senator, as well as hundreds of other governmental officials and employees in Washington, are members of the Association.

It is expected, also, that representatives of all the foreign embassies will attend this first evening session, and many other sessions as well. This expectation rests partly on the clear realization of all that there is "one world of science" in which their peoples participate, and also on the fact that the Association has members in 76 foreign countries.

It is expected that many prominent residents of Washington who are not professional scientists will also attend the first evening session, and other sessions, for they know how greatly society is indebted to science and how much the great scientific societies whose headquarters are in Washington add to the life and culture of this capital city.

Following Dr. Shapley's address there will be a reception with high-ranking governmental officials and members of the diplomatic corps, as well as presidents and past-presidents of the Association, in the receiving line. This notable occasion obviously will be in tune with the theme that there is but "one world of science," a phrase of only four words on which, when fully understood, the highest hopes for the future of mankind rest.

The morning sessions, as outlined by the Centennial Policy Committee, will consist of broad symposia on the major fields of science, participated in by the foremost authorities and intended to be major contributions to the exposition and integration of science. Since the meeting will be limited to five days, it is expected that several morning programs in different fields will be presented simultaneously. The afternoons, according to plans, will be devoted to prearranged visits to the numerous scientific laboratories, libraries, art galleries, and educational and governmental institutions with which Washington abounds.

It would be impossible for the officers of the Association to achieve the possibilities the centenary offers without the full cooperation and assistance of many scientific organizations and scientists in Washington. Invitations were sent out a few weeks ago to the chief executive officers of all the leading governmental, scientific, and cultural agencies in Washington and environs to accept membership in the Honorary Local Planning Committee and to appoint representatives of their respective organizations on the active committees as they are organized. The replies received were gratifying. Not only have the invitations been almost universally accepted, but nearly all of the acceptances have contained very cordial words of approval and expressions of pleasure in rendering the desired assistance. The general committee has met, with 27 members in attendance, and a subcommittee on planning has drawn up specifications for 12 special committees whose duties range from finance to entertainment. Preparations for the Centennial Meeting of the Association next year are well under way.

What does the extraordinary interest in the Association's centenary mean? It means that the Association and its purposes are approved. More importantly, it means the general realization, though not expressed, that there is "One World of Science."

F. R. MOULTON
Administrative Secretary

NEWS *and Notes*

Robert S. Breed, professor of bacteriology, Division of Food Science and Technology, New York State Agricultural Experiment Station, Geneva, retired November 1 after 34 years of service.

W. A. Hamor, assistant director, Mellon Institute for Industrial Research, Pittsburgh, has been appointed editor of the American Chemical Society Monographs, succeeding the late **F. W. Willard.** The Monographs, established in 1920, comprise outstanding reports on research developments in chemical science.

W. Harry Lange, Jr., University of California, Davis, has been granted a 6-month leave of absence to accept an assignment with the Navy through the auspices of the National Research Council. He will study the giant snail and cocoanut beetle, *Brontispa*, in the Marianas Islands and other Asiatic areas. Dr. Lange may also visit the Philippines and the Malay Archipelago in search of natural enemies of this beetle. In addition to devising artificial means for controlling the giant snail, arrangements have been made to collect parasites in Africa which will be forwarded to the Marianas for liberation.

John R. Buhler, associate professor of oral surgery, and secretary to the faculty, Temple University School of Dentistry, has been appointed dean, Emory University School of Dentistry, effective September 1, 1948. He will succeed **Ralph R. Byrnes,** whose request for retirement at that time has recently been granted.

L. W. Le Roy, subsurface geologist, Richmond Exploration Company, Venezuela, has been appointed associate professor, Department of Geology, Colorado School of Mines, Golden, Colorado.

Jules H. Last, recently captain, U. S. Army, who received the Ph.D. and M.D. from the Universities of Chicago and Illinois, respectively, has been appointed assistant professor in the Department of Pharmacology and Toxicology, University of Illinois.

Hyman I. Goldstein was honored on his 60th birthday, November 2, by the National Gastroenterological Association, which dedicated the 15th anniversary number of *The Review of Gastroenterology* to him in recognition of his services rendered to, and his interest in, the Association.

Percival Bailey, distinguished professor of neurology, University of Illinois School of Medicine, delivered the annual James Greenwood Lecture in Neurology at the University of Texas Medical Branch, Galveston, on "The Organization of the Cerebral Cortex." The lecture was arranged to be given in connection with the Central Neuropsychiatric Association which met in Galveston, October 17–18.

Donald Gray, associate professor of anatomy, Stanford University, has been appointed National Institute of Health Fellow and visiting associate professor of anatomy, Wayne University College of Medicine. Under a grant from the Institute he will collaborate with **Ernest Gardner** on a study of the physiology and morphology of human joints.

Visitors to U. S.

Oldrich Karel Sebek, a graduate of the Faculty of Science, Charles University, Prague, Czechoslovakia, is a member of the Seagram International Fellowship Program, observing operations and doing research work at the Louisville, Kentucky, plant of Joseph E. Seagram & Sons, Inc.

Several Australian scientists are now visiting the United States. Among them are **J. L. Pawsey,** Division of Radiophysics, Council for Scientific and Industrial Research, who arrived October 15 to visit American laboratories doing research in radiophysics, and who will remain in this country until early spring; **A. J. W. Moore,** metallurgist, Section of Tribophysics, Council for Scientific and Industrial Research; **D. Martin,** Horticulture Section of Plant Industry, Tasmania, who is studying the growth, ripening, storage, canning, and dehydration of apples; and **H. F. Holden,** research chemist, Walter and Eliza Hall Institute of Medical Research, Melbourne, who is studying physical equipment which might be used in the study of viruses.

Fe del Mundo, professor of pediatrics, University of Santo Tomas, and director of the Children's Hospital, Manila, has been appointed visiting lecturer in pediatrics at the University of Texas Medical Branch, Galveston. She will spend a month in residence at the Medical Branch in teaching the care of infants and children in the tropics.

Grants and Awards

This year's Nobel Prize in Physics has gone to **Sir Edward V. Appleton,** secretary of the Department of Scientific and Industrial Research, London, a pioneer in radar. Sir Edward was cited for his contributions to knowledge of the ionosphere—that is, electrically conductive strata in the upper atmosphere of the earth. The Prize in Chemistry has been received by **Sir Robert Robinson,** president of the Royal Society and professor of chemistry at Oxford, for his research on biologically significant substances from the vegetable kingdom, especially alkaloids.

At the 40th annual meeting of the American Institute of Chemical Engineers on November 11 in Detroit, the A. MacLaren White Award in the Student Problem Contest was presented to **William J. Terrell,** who graduated last spring from Texas A. & M. College and is now employed at the Gulf Oil Corporation, Port Arthur, Texas. Second prize was won by **Eugene Franklin Macbell,** University of British Columbia, and third prize, by **Maurice E. Brooks,** Cooper Union of New York. At the same meeting the William H. Walker Award was presented to **Manson Benedict,** director, Process Development, Hydrocarbon Research, Inc., and **Louis C. Rubin,** manager of research, M. W. Kellogg Company, in recognition of their two papers, "Extractive and Azeotropic Distillation. I: Theoretical Aspects; II: Separation of Toluene From Paraffins by Azeotropic Distillation With Methanol," published in 1945 by the Institute. The Junior Award of the Institute, given to men under 35 for contributions to chemical engineering, went to **Harry G. Drickamer,** assistant professor of chemical engineering, University of Illinois, and **Harry H. Hummel,** formerly of Pan American Refining Corporation,

Texas City, and now studying at the University of Wisconsin, for their joint paper on "Application of Experimental Vapor-Liquid Equilibria to an Analysis of the Operation of a Commercial Unit for the Purification of Toluene From Petroleum," also published in the *Transactions* of the Institute.

Merck & Company, Inc., received the 8th biennial Award for Chemical Engineering Achievement, sponsored since 1933 by the McGraw-Hill magazine, *Chemical Engineering*, at a dinner, December 3, at the Waldorf-Astoria Hotel, New York, as a feature event in the week of the National Exposition of Chemical Industries. This award, outstanding in recognition of group effort, was given to Merck & Company for pioneering the large-scale production of streptomycin.

The President's Certificate of Merit has been presented to five scientists for their outstanding contributions to the country's war effort during World War II as members of the Navy's Operations Research Group. John L. Sullivan, Secretary of the Navy, presented the citations on October 30 to **Maurice E. Bell**, physicist, Walhonding, Ohio; **William J. Horvath,** Operations Evaluation Group, Office of the Chief of Naval Operations, and currently guest at the Electronics Research Laboratory, Massachusetts Institute of Technology; **George E. Kimball,** professor of chemistry, Columbia University; **John R. Pellam,** Department of Physics, Massachusetts Institute of Technology; and **Gerard R. Pomerat,** assistant director, Division of Natural Sciences, Rockefeller Foundation.

William C. Rose, professor of biochemistry, University of Illinois, received the 13th annual Grocery Manufacturers Association of America's scientific award at a luncheon meeting, October 14, during the Association's 39th annual convention at the Waldorf-Astoria Hotel. Prof. Rose was cited for his "numerous fundamental contributions to the science of nutrition, more particularly his studies of essential amino acids; the discovery, isolation, and chemical identification of threonine; and his leadership in nutritional biochemistry."

Boris **Alexander Bakhmeteff,** School of Engineering, Columbia University, and **William Allan,** dean, School of Technology, College of the City of New York, will receive the Norman Medal, given annually by the American Society of Civil Engineers for the best technical article published in the Society's *Transactions*. The Medal, established in 1872 by George H. Norman, will be presented at the Society's annual meeting in New York, January 21. The winning article, entitled "The Mechanism of Energy Loss in Fluid Friction," appeared in Volume III of the 1946 *Transactions*.

Boyd H. Bode, professor emeritus of education, Ohio State University, was presented the William H. Kilpatrick Award on November 10 at Teachers College, Columbia University. The award is given by Teachers College in recognition of outstanding contributions in the field of the philosophy of education. Dr. Bode had been a member of the faculty of the College of Education, Ohio State, for 23 years prior to his retirement three years ago.

James Fitton Couch, research chemist, Eastern Regional Research Laboratory, U. S. Department of Agriculture, Wyndmoor, Pennsylvania, was one of five employees of the Department granted the "Distinguished Service Award" by Secretary Anderson on November 12. Dr. Couch received the award in recognition of his chemical research on farm products which led to the discovery that rutin, a constituent of tobacco, buckwheat, and other plants, is effective in reducing capillary fragility and permeability of the blood capillaries. He has been associated with the Department of Agriculture since 1917 and since 1940 has been in charge of the Tobacco Section at the Eastern Regional Research Laboratory.

Ida A. Bengtson, who recently retired as senior bacteriologist in the Division of Infectious Diseases, National Institute of Health, a position which she had held for a number of years, was awarded the medal of the United States of America Typhus Commission on November 3. Dr. Bengtson was cited for her outstanding contribution to the prevention and control of typhus fever during World War II. Surg. Gen. Thomas A. Parran presented the medal, and the citation was read by R. E. Dyer, director of the Institute.

W. Harley Barber, emeritus professor of physics, Ripon College, Ripon, Wisconsin, has been chosen to receive the Oersted Medal for 1947. This medal is awarded annually by the American Association of Physics Teachers in recognition of notable contributions to the teaching of physics. The formal award and presentation of the medal will take place during the annual meeting of the Association on Tuesday afternoon, December 30, 1947, in the Kent Theater, University of Chicago.

Howard N. Eavenson, president, Bituminous Coal Research, Inc., Pittsburgh, received the Percy Nicholls award, which is conferred "for notable scientific or industrial achievement in the field of solid fuels," October 20, at the banquet of the 10th national fuels conference of the American Society of Mechanical Engineers and the American Institute of Mining and Metallurgical Engineers, Cincinnati, Ohio.

Eugene Gifford Grace, chairman of the Board, Bethlehem Steel Corporation, will be awarded the Charles F. Rand Gold Medal for "distinguished achievement in mining administration," at the annual meeting of the American Institute of Mining and Metallurgical Engineers to be held in New York in February, according to an announcement made by Clyde Williams, president of the Institute, at a dinner of the Metals Divisions in Chicago, October 21.

At the last annual meeting of the ACFAS (French-Canadian Association for the Advancement of Science) the Leo-Pariseau medal was awarded to **Jacques Rousseau,** director of the Montreal Botanical Garden. This medal is granted once a year to one scientist of French-Canada for the whole of his scientific publications.

Ludwik Anigstein, professor of preventive medicine, University of Texas Medical Branch, Galveston, has recently received a grant of $2,500 from the Lederle Laboratories for the support of special studies on rickettsial diseases.

Milton G. Levine and **Robert E. Hoyt,** of the Institute of Experimental Medicine, College of Medical Evangelists, Los Angeles, have been granted $500 by the Committee on Research of the American Medical Association to continue their studies on commercial Rh antiserums.

Lewis F. Hatch, University of Texas, has recently received a $3,100 grant-in-aid

from the Research Corporation of New York, a continuation of a grant received last year for basic research on the influence of geometrical isomers on the chemical activity of allylic chlorides. **Stuart Nesbitt** and **Harold Alexander** will work on the syntheses of new allylic chlorides and study their reactions. It is expected that further insight into the manner by which the arrangement of atoms influences certain chemical reactions will be obtained.

Fellowships

Five Lalor Foundation fellowships were awarded at the Woods Hole Marine Biological Laboratory in the summer of 1947. The holders of these fellowships and the subjects of investigations were as follows: **Jean Brachet** (senior fellow), University of Pennsylvania and University of Brussels, "Quantitative studies on nucleic acid synthesis in sea urchin eggs and cytochemical studies on nucleic acid distribution in developing eggs"; **Irving M. Klotz,** Northwestern University, "Study of the structural and environmental factors which influence the binding of small molecules by proteins"; **Benjamin Libet,** University of Chicago, "Localization and properties of adenosinetriphosphatase in the giant nerve fiber of the squid"; **Arnold Lazarow,** Western Reserve University, "Studies on the induction and nature of diabetes in the toad fish"; and **Claude A. Villee, Jr.,** Harvard Medical School, "Extraction and study of nucleoproteins and nucleic acids of invertebrate tissues." Similar fellowships will be available in 1948 (see *Science,* November 7, p. 442).

The University of Illinois Graduate College has announced the availability of four research fellowships to be awarded for one year in the fields of medicine, dentistry, and pharmacy at the stipend of $1,800 per year. Candidates must have completed a training of not less than 8 years beyond high school graduation, and must indicate the field of research in which they are interested and submit transcripts of their scholastic credits, together with the names of three former science teachers as references. Appointments will be announced January 1, 1948, or shortly thereafter. The fellowship year begins July 1, 1948, and in some cases, September 1, 1948. Formal application blanks may be secured from the Secretary of the Committee on Graduate Work in Medicine, Dentistry, and Pharmacy, 1853 W. Polk Street, Chicago 12, Illinois.

Colleges and Universities

A Department of Biochemistry and Nutrition was established this fall in the College of Liberal Arts and Sciences, University of Southern California. The new Department is headed by **H. J. Deuel, Jr.** Staff members are **John W. Mehl,** professor; **Richard J. Winzler,** associate professor; **Margaret G. Morehouse, Bradley T. Scheer,** and **Walter Marx,** assistant professors; and **Donald T. Visser,** instructor. The staff is jointly responsible for biochemistry in the University's School of Medicine.

Expansion of Oklahoma Baptist University's Geology Department, with addition of three junior-level courses during the school year 1948–49, has been announced. Courses in hydrology, introductory invertebrate paleontology, and sedimentation are to be added to the courses in physical geology, historical geology, mineralogy, and structural geology now being taught. According to President John W. Raley, completion of departmental quarters in one wing of the new science building and large additions to the fossil and mineral collections have made the expansion possible.

Industrial Laboratories

The 94 years of history behind the Bausch & Lomb Optical Company at Rochester, New York, are interesting ones. On November 3, 1853, the business that is now the world's leading producer of scientific optical instruments was founded on $60 loaned to John J. Bausch by his friend and associate, Capt. Henry Lomb. Eight years later, the two young men installed the first power lens-grinding machine in this country. During the Civil War, Lomb mailed his Army pay to his partner to keep the struggling company on its feet. In 1868 the firm began to grow and moved to larger quarters at River and Water Streets, Rochester; it moved again 6 years later to the company's present site, then with a staff of 96 men and women. The firm was now under the direction of Edward Bausch, oldest son of the founder. During the next few years, photographic lenses, bifocal lenses, binocular microscopes, and iris diaphragm shutters were designed, and during the Spanish-American War, the firm produced the Navy's first gun fire control instruments used by Dewey at Manila. Several years later, William Bausch, brother of Edward, became interested in the making of optical glass and in 1915 turned out the first pure melt produced in America, making Bausch & Lomb the sole source of supply in this country during World War I. During the recent war, Bausch & Lomb's bubble sextants, rangefinders, periscopes, radar optics, mobile optical units, aerial mapping equipment, and dive-bomber sights were used extensively.

F. M. Hildebrandt has been appointed director of laboratories, U. S. Industrial Chemicals, Inc., and in this capacity will have general supervision of all research activities of the Company in the Baltimore area, including fermentation research, entomological research, and application research. Dr. Hildebrandt has been associated with USI since 1924.

Harold Blumberg, formerly with Winthrop-Sterling Research Institute, has become associated with Endo Products Inc. as head of the pharmacology laboratory.

The Sun Oil Company will soon consolidate its wide-spread scientific activities into a proposed Science Center at Newtown Square, Pennsylvania, at which most of the research and experimental work now being done at the Company's Marcus Hook Refinery and at its laboratories at Norwood, Pennsylvania, will eventually be carried on. When completed, the proposed Science Center will be equipped with the most modern standard facilities for petrochemical and physical research work. This reorganization of the Company's scientific activities will not affect the geophysical laboratories under the Production Department in Dallas and Beaumont, Texas, or the Automotive Laboratory and certain technical service groups at Marcus Hook and Toledo Refineries. A Physical Laboratory is already under construction at Newtown Square. This new, independent Research Department will be directed by **John R. Bates,** formerly assistant to the vice-president in charge of manufacturing. **J. Bennett Hill,** manager, Development Division, Manufacturing Department, **John M. Pearson,** director, Physical Research and Development, Production Department, and **Stewart S. Kurtz, Jr.,** manager, Experimental Division, Manu-

cturing Department, have been appointed assistant directors.

Meetings

The American Society of Agricultural Engineers will hold its annual winter meeting at the Stevens Hotel, Chicago, December 15–17. The meeting will feature programs of the Society's four technical divisions: Power and Machinery, Rural Electric, Farm Structures, and Soil and Water. The Rural Electric Division will consider farm wiring, use of electrical equipment to increase productive efficiency, and uses of radiation in agriculture. The Farm Structures Division will emphasize grain storage and livestock feeding with particular emphasis on the influence of design on sanitation, labor efficiency, and other economy factors. On the Power and Machinery program, flexible power transmission, power take-off drives, self-propelled field machines, and new farm machines will be discussed. The Soil and Water program will consider new developments and problems in upstream flood control, drainage, hydrology, and terracing.

The Society was organized in 1907 at the University of Wisconsin "to promote the science and art of engineering in agriculture; to encourage original research; to foster agricultural engineering education; to advance the standards of agricultural engineers among themselves and with allied technologists; to encourage the professional improvement of its members; and to broaden the usefulness of agricultural engineering." The Society now has more than 2,000 members, most of whom are agricultural engineers employed in public service, research, teaching, and agricultural extension work in state, federal, and private agencies.

The December midyear meeting of the American Pharmaceutical Manufacturers' Association will be held at the Waldorf-Astoria Hotel, New York, December 15–17. On Tuesday, the 9th annual scientific award will be presented to the American Medical Association in recognition of its fundamental contributions to public health in the field of medical research. A few of the speakers to be heard are the following: Monday morning, H. R. Horner, president, Canadian Pharmaceutical Manufacturers' Association; Fred J. Stock, president, Drug, Chemical and Allied Trades Section, New York Board of Trade, and vice-president, Charles Pfizer & Company, Inc.; E. Fullerton Cook, chairman, Committee on the *U. S. Pharmacopoeia*; and Justin Powers, chairman, Committee on the National Formulary; Monday afternoon, Morris Fishbein, editor, *Journal of the American Medical Association*; and R. L. Sensenich, president-elect, American Medical Association; Tuesday morning, Austin Smith, secretary, Council on Pharmacy and Chemistry, American Medical Association; Banquet, Tuesday evening, Edward L. Bortz, president, American Medical Association; Wednesday afternoon, J. Mark Hiebert, executive vice-president, Sterling Drug Company; William Douglas McAdams, president, Wm. Douglas McAdams Agency, New York; and Kenneth F. Valentine, president, Pitman-Moore Company, Indianapolis. Additional speakers at all sessions are to be announced.

The National Academy of Peiping recently celebrated its 19th anniversary in Peiping. S. H. Li, the associate director, presided over the ceremony, and P. C. Hsu, director of the Institute of History, and C. T. Yen, director of the Physics Institute, lectured on the occasion.

The 428th meeting of the American Mathematical Society was held at Hunter College, New York City, Saturday, October 25, with an attendance of over 200, including 185 members of the Society. C. B. Allendoerfer, Haverford College, addressed the group on "Global Theorems in Riemannian Geometry." Forty-five research papers were presented, 14 in person, and 31 by title.

Third Conference on Iroquois Research

Anthropologists of Canada and the northeastern states met for the third year at Red House, New York, October 24–26, 1947, to report and discuss researches undertaken since the previous conference. The group is again grateful to the Hon. Charles E. Congdon, chairman, Allegany State Park Commission, for making available the Administration Building on Red House Lake, and to M. H. Deardorff, of Warren, Pennsylvania, who shared with Mr. Congdon details of planning the conference. Central location in the wilderness away from cities and nearness to Seneca Indians make Red House the ideal meeting place for such a conference.

Substantial accomplishment in Iroquoian studies was manifest in reports and discussion at the several sessions. Hilton M. Hill, himself an Iroquois and retired clerk of the Six Nations Agency, Brantford, offered a provocative paper on Acculturation in Mohawk Language, which he had prepared with Martha Huot. Mrs. Huot mentioned her studies of character structure among Iroquois women.

The second day was devoted principally to archaeology. In discussing the approaches to the study of the historic archaeology of Huronia, T. F. McIlwraith, assisted by Margaret M. Thomson, related the program and summarized important results achieved in collaboration between the Royal Ontario Museum of Archaeology and the Jesuit Order.

The afternoon session preserved the high level of the morning. James B. Griffin conducted an inquiry into old theories and new light on the origin and differentiation of Iroquoian culture as revealed by archaeology, to which Richard S. MacNeish made the principal contribution by describing a study during 1947 of seriation in pottery taken from historic, protohistoric, and prehistoric Iroquois town sites. Reports on parallel field work in historic sites of Munsi and Lenape Delaware subtribes came from W. A. Ritchie and John Witthoft.

To remind the group of living Iroquois culture, Albert Jones, of the Coldspring Longhouse, brought about 20 members of the Seneca community, including Chauncey Johnny John, to perform social dances in honor of F. G. Speck, who prefaced the numbers with significant program notes.

At an executive session on the future of the Conference, held Sunday morning with W. N. Fenton presiding, sentiment was unanimous for continuing the yearly conferences, for preserving the record, and for meeting at the same place another year. It was decided to leave the formulation of an over-all plan for research in the area to a committee appointed by the chairman to report at the 1948 session.

Those present included: Guthe, New York State Museum; Leechman, National Museum of Canada; McIlwraith and M. Thomson, Toronto; Speck, Carpenter, Stern, and Anthony Wallace, Pennsylvania; de Laguna, Bryn Mawr; Dodge, Peabody Museum, Salem; Ritchie, Knoll, and Chase, Rochester; M. Huot, Columbia; Noon, Wilson College, Chambers-

burg, Pennsylvania; MacNeish, Chicago; Griffin, Jones, Spaulding, Coe, Howard, and Witthoft, Michigan; Hassrick, Congress of American Indians, Washington; and Fenton, Smithsonian Institution. (WILLIAM N. FENTON, *Smithsonian Institution, Washington, D. C.*)

Elections

The American Institute of Chemical Engineers, at its 40th annual meeting held November 9–12 in Detroit, elected Albert B. Newman, professor of chemical engineering, and formerly dean of engineering, City College of New York, president; F. J. Curtis, vice-president, Monsanto Chemical Company, vice-president; Stephen L. Tyler, Garden City, Long Island, executive secretary; and C. R. DeLong, consulting chemical engineer of New York City, treasurer. New directors include M. C. Molstad, head, Department of Chemical Engineering, University of Pennsylvania; John J. Healy, Jr., Merrimac Division, Monsanto Chemical Company, Everett, Massachusetts; William T. Nichols, technical assistant to the executive vice-president, Westvaco Chlorine Products Corporation, New York; and William I. Burt, vice-president, B. F. Goodrich Chemical Company, Cleveland, Ohio.

The Organic Division, American Chemical Society, has recently elected Paul D. Bartlett, professor of chemistry, Harvard University, as chairman to succeed Arthur C. Cope. Ralph W. Bost, University of North Carolina, was reelected secretary; and Ralph L. Shriner, Iowa State College, William G. Young, University of California, and Dr. Cope were named to the Executive Committee.

The International Association of Milk and Food Sanitarians, Inc., is the new name adopted by the erstwhile International Association of Milk Sanitarians, Inc., founded in 1911. The newly elected officers are as follows: president, W. D. Tiedeman; first vice-president, A. W. Fuchs; second vice-president, M. R. Fisher; third vice-president, K. G. Weckel; secretary-treasurer, J. H. Shrader.

The objectives under the enlarged scope comprise milk and general dairy products sanitation and quality, as heretofore, and, in addition, general food sanitation in its production, processing, and distribution, and in restaurant operation from the standpoint of cleanliness, safety, and quality of food and equipment; in short, in food sanitation—its healthfulness, its organoleptic quality, its attractiveness, its cleanliness, and its public health safety.

NRC News

National Research Fellowships in the Natural Sciences are available for the year 1948–49, according to an announcement from the Fellowship Office. This program, financed by grants from the Rockefeller Foundation and administered by the National Research Council for the past 28 years, is designed to permit young men and women with research ability to spend additional time in uninterrupted study. The program includes the physical and mathematical sciences, geology and geography, biological and agricultural sciences, anthropology, and psychology. Candidates must have completed the requirements for the Ph.D. Stipends are at the rate of $2,500 per year, plus travel to the place of study, but larger stipends may be granted to Fellows with dependents. Appointments are for one year, but reappointment for an additional year may be made in some cases. Applications for study abroad have been granted in cases where the additional advantages make it desirable. Further information may be obtained from the National Research Council Fellowship Office, 2101 Constitution Avenue, N. W., Washington 25, D. C.

Deaths

W. P. Bradley, 85, research chemist, died September 14 at his summer home in Southampton, Long Island, after an illness of several weeks. Dr. Bradley was professor of chemistry at Wesleyan University, Middletown, Connecticut, from 1893 to 1914.

Max Huhner, 74, urologist who devised the Huhner Test for sterility, and chief of the Clinic, Genito-Urinary Department, Mount Sinai Hospital Dispensary, died October 4 of a heart ailment at his home in New York City.

K. H. Bouman, 73, formerly professor, Amsterdam University, and a well-known Dutch neurologist and psychiatrist, died November 8.

Sidney Isaac Schwab, 75, professor emeritus of clinical neurology, Washington University, and at one time president of the American Neurological Association, died at Phillips House, Boston, November 12, after a brief illness.

Robert F. Chambers, 60, chairman Department of Chemistry, since 1929, a Newport Rogers professor of chemist Brown University, died November 17 the Jane Brown Hospital, Providen Rhode Island.

Edwin Diller Starbuck, 81, former professor of psychology, University Southern California, and director, In tute of Character Research, died Nove ber 18 at Rio Del Marz, California.

Carlton H. Maryott, 66, professor biochemistry at the University of Geor School of Medicine since 1914, di November 19 in Augusta, Georgia.

Curtis Field Burnam, 70, radiologi and a member of the surgical facult Johns Hopkins University, died Nove ber 29 after an illness of several month

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International congresses on experimental cytology were organized, pri to the recent war, by the Internation Society for Experimental Cytology. A the International Cytological Congres held in Stockholm last July under the aus pices of a truncated committee of the In ternational Society, the old society w dissolved, and a new one, the Society fo Cell Biology, was founded. The ne Society, a member of the Internation Union of Biological Sciences, will b responsible for future international cy tological congresses.

At Stockholm the following officers an committee were elected: president: J Runnström (Sweden); vice-presidents E. Fauré-Fremiet (France), E. Newton Harvey (U.S.A.), and G. Levi (Italy); secretary-treasurer: J. F. Danielli (Great Britain); Committee: T. Caspersson (Sweden), Honor B. Fell (Great Britain), A. Frey-Wyssling (Switzerland), G. C. Heringa (Holland), H. Okkels (Denmark), and Paul Weiss (U.S.A.). Many of these officers and committee members held office in the old International Society for Experimental Cytology, of which Prof. Okkels was secretary.

Election to membership in the Society for Cell Biology will normally be based on original contributions to knowledge in experimental cytology, experimental histology, and related fields. One hundred

ndation Members, chosen mainly n those present at the Stockholm Con-s, but including a few of those who had given distinguished assistance to old Society, were invited to partici-e in the formation of the new Society. olications for membership in the So-y will be welcomed. They may be ad-ssed to Dr. J. F. Danielli, Royal Can- Hospital, London S.W.3, England, or any officer or committee member of Society. Applications should normally accompanied by a list of references to ginal contributions to knowledge.

The American Museum of Natural story is sending a major expedition o Central Africa in order to explore and cord photographically the only remain- "unspoiled" native region of Africa. e expedition will be led by **James L.** ark, chairman, Department of Prep-tion and Installation at the Museum, o is a veteran of 25 major Museum peditions, four of which were other rican safaris. Dr. Clark has already left Africa to complete preparations prior the arrival of the remainder of the oup, which will include **Neal A. Weber,** sociate professor of zoology, Swarth-ore College; **Brayton Wilbur,** presi-nt, San Francisco Chamber of Com-erce, who is sponsoring the expedition; apt. **Vivian Ward** of Nairobi; **Murl** eusing, curator of Education, Public luseum, Milwaukee, Wisconsin; and 35 more natives who will be specially ained for the work. The expedition, hich will penetrate the remote south-estern Sudan and the adjoining area of outheastern French Equatorial Africa, ill also study the almost extinct white hino, which, next to the elephant, is the rgest of all land mammals and has rely been photographed. The field re-earch on insect life, to be under the direc-ion of Dr. Weber, will perhaps be he major contribution of the expedi-ion. Dr. Clark also expects that many ew species of snakes, lizards, fish, and mall mammals and birds will be un-overed.

Increased appropriations for the esearch program and activities of he Illinois State Geological Survey, division of the State Department of Registration and Education and one of hree scientific surveys that come under he purview of the State Board of Natural Resources and Conservation, have re-cently been approved by the General Assembly of Illinois and Gov. Dwight H. Green. The current biennial budget for geological and geochemical research amounts to $1,106,590, an increase of about $160,000 over that of the preceding biennium. In addition, the Legislature made a total appropriation of $127,550 for topographic mapping and $1,764,623 for additions to the Natural Resources Building that jointly houses the Geological Survey and the Natural History Survey.

According to **M. M. Leighton,** chief, the Survey has for the past 16 years maintained a thoroughgoing research program on the geology and mineral resources of Illinois. The chief purposes have been to meet more adequately the needs of the State's manufacturing industries, mineral industries, and construction industry; to solve groundwater supply problems; and to aid transportation development, the educational system, the citizens, and the administrative departments of the State. The scope of the Survey's program extends from studies of the geology and mineral deposits in the field through laboratory studies of mineral utilization to the economics of the flow of minerals within their natural market areas. Laboratory research includes projects of both a fundamental and an applied nature and some experimental work on pilot plant scale.

The topographic mapping of the State is carried on by the U. S. Geological Survey in cooperation with the State Geological Survey, on a matching dollar-for-dollar basis.

In addition to these activities and its widespread service to the industries of the State, the Survey maintains an Educational Extension Division which provides teaching material to the public schools on the geology and mineral resources of Illinois and popular illustrated lectures to organizations.

Detailed plans have been completed and contract awards made for two new wings to the present Natural Resources Building which will double the space available to both the Geological and Natural History Surveys.

The AF School of Aviation Medicine, Randolph Field, Texas, is establishing an aeromedical historical museum as a public service. Although aviation medicine is a comparatively new specialty, having been established in 1917, the methods and equipment it has employed both in the laboratory and in the aircraft have shown remarkable progress. Although it is feared that many of the articles of early equipment and items of historical interest may already have been destroyed or lost, it is hoped that those still remaining can be preserved. Anyone having suitable material which he would be willing to loan or donate to this museum is requested to communicate with the Commandant, School of Aviation Medicine, Randolph Field, Texas. All material loaned or donated will be credited to the donors. Early manuscripts and documents, experimental laboratory devices, aircraft oxygen equipment, parachutes, flying clothing, and all other similar items are desired.

A new monthly engineering and scientific journal world wide in scope will appear in January under the co-sponsorship of the American Society of Mechanical Engineers, the Engineering Foundation, Illinois Institute of Technology, and other organizations. Each issue of the new journal, to be called *Applied Mechanics Reviews*, will contain about 200 signed reviews, including bibliographies, of current literature in the field. **L. H. Donnell,** research professor of mechanics at Illinois Tech, has been appointed editor-in-chief, and **S. P. Timoshenko,** professor emeritus of Stanford University, a widely recognized authority on applied mechanics studies, will be editorial adviser. Offices of the publication will be located at the Engineering Societies Building, 29 West 39th Street, New York City.

The Photographic Society of America again this year held a Technical Exhibit as part of the Exhibition of Photography which was hung in the Oklahoma City Art Center in connection with its annual convention. Because of the general interest of this third exhibit two Traveling Print Shows of about 35 prints each have been selected as representative of the newer uses of photography in science and industry. These shows will be available to PSA groups, camera clubs, technical societies, engineering societies, and other scientific organizations for public hangings from December of this year through November 1948. Requests stating where the prints would be hung, the available hanging facilities, and any preference for dates should be made to Earl R. Clark, 184 Malden Street, Rochester 13, New York.

The land life of the Palau Islands in the western Pacific will be studied by an expedition headed by **Henry S. Dybas,** assistant curator of Insects, Chicago Natural History Museum. The expedition, which left October 15, is a cooperative project of the Chicago Museum and the Pacific Science Board. The Palau Islands are a part of the large Micronesian region which was formerly under Japanese control, and which the Museum has already helped to survey through a recent expedition conducted by **Alexander Spoehr,** curator of Oceanic Ethnology.

The Commission on Influenza, Army Epidemiological Board, Office of the Surgeon General, U. S. Army, recognizing the potential importance in the epidemiology of influenza of antigenic differences among strains of influenza virus, has for several years maintained under its auspices a Center for the study of strains of influenza virus under the supervision of Thomas P. Magill at the Cornell University Medical College, 1300 York Avenue, New York City.

Because the problem is one of importance in the recurrence of epidemics and in the preparation of vaccines, the objectives of the Influenza Virus Strain Study Center include a search for strains of broad immunizing potency and also for strains which differ sharply from the ones currently included in influenza virus vaccines. In addition to those purposes the Center serves as a store for potent antiserums to be distributed, in limited quantities for diagnostic purposes, to U. S. Army laboratories and Influenza Commission field units; it serves also as a store for the preservation of strains of virus.

Whether a large number of stable strains of influenza virus exist, or whether the influenza virus is a relatively unstable agent whose antigenic characteristics may readily change, has not been established; however, the rather sudden manner of appearance of strains which differ sharply in antigenic characteristics from standard strains suggests that the latter alternative may be the correct one. Regardless of which alternative is correct, the fact that such strains do appear suddenly makes it imperative that a vaccination program include a careful watch for the appearance of significant variants. Obviously, the more widespread the watch, the greater the chances of success.

The Commission on Influenza, therefore, is endeavoring to broaden the watch for significant variants by increasing the interest in the accurate laboratory diagnosis of influenza. For that reason, the Strain Study Center offers a diagnostic service by which laboratories not equipped for the work may obtain rapid identification and serological classification of strains which they have isolated. It is requested that even those laboratories which are prepared to identify the broad groups of the strains of the viruses of influenza A and B submit such strains to the Center for further study as soon as possible after isolation.

The first self-sustained chain-reacting pile was achieved five years ago this week. On Tuesday the University of Chicago honored several of the scientists who had witnessed the experiment under the direction of Enrico Fermi which took place December 2, 1942, on the University's Stagg Field.

The ceremonies were opened with a luncheon held by the Citizen's Board of the University, Henry F. Tenney, chairman of the Board, presiding. Among the speakers were Sumner Pike, vice-chairman of the AEC; Enrico Fermi; Charles H. Swift, of the University's Institute of Nuclear Studies, designer of the pile; Walter H. Zinn, director of the Argonne National Laboratory of the AEC; Farrington Daniels, of the University of Wisconsin, chairman of the Board of Governors, Argonne National Laboratory; and Robert M. Hutchins, chancellor of the University.

Later in the afternoon the group witnessed the dedication of a bronze plaque marking the site of the experiment on Stagg Field. The ceremonies included the unveiling of the plaque by Dr. Daniels and remarks by William W. Waymack, of the AEC, and Drs. Fermi, Zinn, and Hutchins.

The National Bureau of Standards has compiled a *Directory of Commercial and College Laboratories*, now available from the Government Printing Office as NBS Miscellaneous Publication M187. The *Directory* lists all testing and research laboratories, together with an indication of the type of commodities tested. The Bureau makes tests and carries out investigations for other government organizations, but does not make tests for private individuals if other laboratories can do the work with the required accuracy. Since inquiries regarding s service are often received, this classi list was assembled to inform interes persons of the location of other tes facilities and to aid purchasers equipped to make their own accepta tests. The geographical and alphabet listing includes 220 commercial labo tories with 80 branches or offices and college laboratories used for research testing. The *Directory* is available o from the Superintendent of Docume Washington 25, D. C., at $.30 per copy

A fossil skull of the dinosaur, *T saurus latus* Marsh, has recently b placed on exhibit in the Hall of Ea History, Academy of Natural Sciences Philadelphia. A restoration model of t animal is being shown with the sk which was studied and described Edwin H. Colbert, associate cura of Geology and Paleontology in t Academy. The skull was collected n Camp Crook, South Dakota, in 1944 Ralph Pemberton and E. Curzon Pu ney, members of the Academy.

Make Plans for—

Psychoanalytic Association, Dece ber 15–17, New York City.

Paleontological Society, Decemb 28–31, Ottawa, Canada.

American Anthropological Assoc ation, December 28–31, University New Mexico, Albuquerque.

American Astronomical Society December 28–31, Ohio State Universit Columbus.

Association of American Geogra phers, December 29–31, Charlottesvil Virginia.

Archaeological Institute of Amer ca, December 29–31, New Haven, Co necticut.

Geological Society of America December 29–31, Chateau Laurie Ottawa, Canada.

American Association for the Advancement of Science, 114th Meeting, December 26–31, Chicago, Illinois.

TECHNICAL PAPERS

The Disappearance of Salt From Glass Ice During Low-Temperature Dehydration, and Its Implication in Electron Microscopy

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There are empirical observations in the literature that cells can be dried without the movement of salt only if they are quickly frozen to produce a glass ice, and then if the subsequent dehydration is accomplished at temperatures below about −55°C. (see the review of G. H. Scott. *Biol. Sympos.*, 1943, 10, 277). Ordinary lyophilizing temperatures greatly exceed this and cannot be expected to immobilize inorganic ions. These findings obviously have a very important bearing on the preparation of biological materials for the electron microscope.

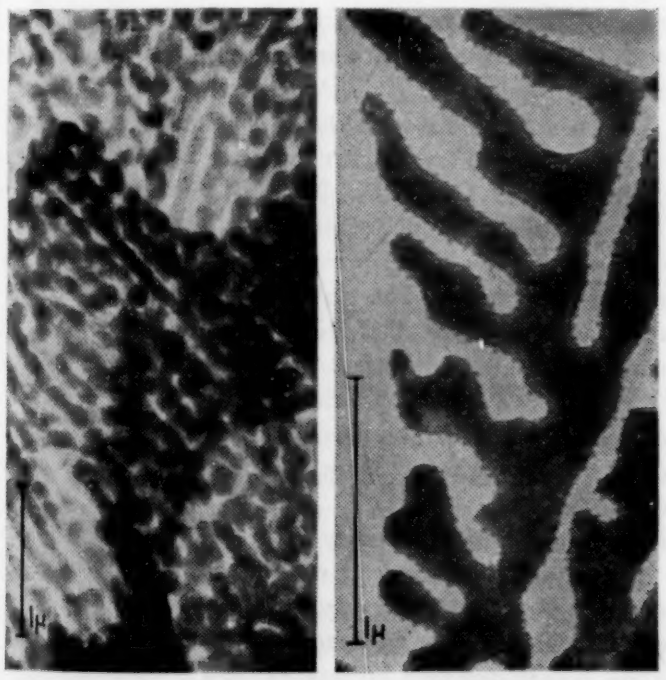

FIG. 1. The electron micrographs were made from a myosin sol originally dissolved in 0.5 M KCl. The aqueous film was frozen in liquid air and then dehydrated at −72°C. Note the total absence of any obscuring salt deposition.

It is for this reason that we have had in our laboratory a cryostat which is capable of dehydration at the temperature of a dry ice and alcohol mixture (−72°C.). This instrument has been in operation for more than a year, and we have prepared a considerable variety of biologically interesting specimens with it after first freezing them in liquid air. They have finally been examined with the electron microscope after such fragmentation as has been necessary.

A striking thing is that salt crystals have rarely been seen in material prepared by this method in spite of high tissue concentrations to begin with. Specimens which were relatively thick and bounded by membranes (as muscle fibers) undoubtedly retained their salt *in situ*, for even thin fragments had a high electron density. Single myofibrils, for example, were ordinarily quite opaque in spite of being less than 1 μ in thickness.

However, when one was dealing with a porous structure, the salt originally present disappeared in some undetermined manner. Thus, the intercellular "fluid" of loose connective tissue (perimysium has been most studied) showed a very low electron density. More dramatic and more definitive, though, were preparations made to study the structure of myosin sols. Aqueous films of purified myosin dissolved in KCl were frozen and dried as indicated. The salt concentrations were varied from 0.3–1.0 M. Although the details of the myosin structure will be described in a subsequent paper, it is necessary to point out here that the myosin was aggregated in long, fingerlike processes which often branched. Thus, a 3-dimensional network was formed, with a pore size that would be measured in only fractions of microns. That this mesh could offer delicate support is shown by Fig. 1. In these preparations there was never any trace of salt deposition, either in the interstices of the mesh or upon the myosin aggregates, and either in a crystalline form or in an amorphous mass. For all practical purposes the free and unbound salt had simply disappeared!

A special investigation would be necessary to determine where the salt goes under these circumstances. It would seem, however, that the phenomenon must depend upon the fact that one is dealing with ions that are fixed in a solid, yet are not associated in a crystal lattice. Conceivably the slightest jar after dehydration disperses them either as free ions or as molecules. But then one would expect that at least occasional masses would be caught and trapped in interstices such as are present in the myosin net. There was no evidence of this in porous structures, although there was within cells. The remaining possibility would seem to be that the ions (or perhaps molecules) literally evaporate from the regressing glass-ice surface during the dehydration. At first thought this latter suggestion would seem to run counter to physicochemical doctrine. But the author is not aware of any vapor-pressure work having been done on comparable systems in which isolated ions could be expected to appear on an evaporating solid surface. The attractive forces should be very different than at either a crystal face or a fluid surface, the ionic mobility being unimpaired in the latter. One may hazard the guess that the ionic or molecular vapor pressure may be quite appreciable at an evaporating glass-ice surface where isolated ions become exposed. If this latter hypothesis is the correct explanation of the observed phenomenon, it should be possible to find evaporated salt trapped or plated somewhere in the pumping system. It is likely that radioactive tracer techniques could be employed to good advantage to determine this. But in any case, aqueous systems containing high concentrations of salt can be prepared by this method for effective use with the electron microscope.

Incorporation of C^{14} From Carboxyl-labeled *dl*-Alanine Into the Proteins of Liver Slices[1]

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The source of energy for the formation of peptide bonds in living tissue is not known. Study of protein or peptide synthesis is hampered by the proteolysis which, in tissue outside the intact animal, always seems to predominate. Melchior and Tarver (*5*) have summarized the difficulties involved and have shown how they may be overcome by the use of tracers. The present paper describes preliminary studies of protein formation in liver slices, as measured by the incorporation of carboxyl-labeled alanine.

Carboxyl-labeled *dl*-alanine was prepared by the Strecker synthesis (*8*), with modifications appropriate for use of small amounts of radioactive hydrogen cyanide. The hydrogen cyanide was generated from potassium cyanide made by the method of Cramer and Kistiakowsky (*2*), with certain changes.

Eight-tenths gram of clean potassium was placed in a 10 mm. x 400 mm. Pyrex tube (capacity, about 14 cc.). This tube was attached to a vacuum line, and the potassium was shaken and distilled to form a continuous thin mirror over the entire inner surface of the tube. Approximately 2 millimoles of ammonia and the carbon dioxide from 8.5 mg. of radioactive barium carbonate (stated to contain 3–5 per cent $BaC^{14}O_3$) and from 179 mg. of nonradioactive barium carbonate were condensed in the reaction tube with liquid nitrogen. This tube, containing potassium, ammonia, and radioactive carbon dioxide, was sealed and placed in a steel bomb tube, which was inserted in an electric furnace. The temperature was raised to 620° C. in 8 minutes and was then held constant for 12 minutes. After cooling, the glass tube was removed and chilled in liquid nitrogen. The end of the tube was heated with a hot flame and the excess pressure released. The small amount of residual metal was decomposed with ethyl alcohol and water. After transfer to a generating flask on the vacuum line, and after preliminary evacuation, formic acid was added and the hydrogen cyanide distilled into a trap along with about 1 cc. of water. With inactive CO_2 the yield here was 90–96 per cent (average, 92 per cent).

The solution of hydrogen cyanide was transferred to a reaction flask along with 4 millimoles of ammonia and 2 millimoles of acetaldehyde and left overnight. Four cc. of 40 per cent hydrobromic acid was added and the solution boiled down to a paste during 4 hours. The paste was stirred at −40° C. with 3 cc. of methyl alcohol, filtered, and washed once with 2 cc. of cold methanol. The filtrate was neutralized with ammonium hydroxide. In order to recover the small amount of synthesized *dl*-alanine, 0.25 gram of ordinary *dl*-alanine was added, with heating. On cooling, 0.22 gram of carboxyl-labeled *dl*-alanine separated (m.p., 250° C. dec.; mixed m.p. with authentic pure sample, 250° C. dec.; activity 10 μc./mM).

Into Warburg flasks were pipetted 1–2 cc. of Krebs-Ringer phosphate solution (*3*, *9*) and 0.1–0.2 cc. of a solution of radioactive *dl*-alanine containing 0.86 mg. of *dl*-alanine/cc. If 0.1 cc. was added, the total activity per flask was about 21,000 counts/minute. Two-tenths cc. of 10 per cent potassium hydroxide was placed in each center well.

An adult Wistar rat was killed by decapitation. The liver was removed, and slices about 0.5 mm. in thickness were cut. The dry weight of each slice was 10–20 mg. Two to four slices were placed in each flask, the flasks then being attached to their manometers and the air washed out with either oxygen or nitrogen. After incubation at 37° C., with shaking, for varying lengths of time, the slices were removed and rinsed with two 20-cc. portions of water. They were then placed in a test tube, with 5 cc. of water, and homogenized with a glass pestle (*7*). After transfer to a centrifuge tube, 5 cc. of 20 per cent trichloracetic acid was added. After 15 minutes, the precipitated proteins were centrifuged and washed three times with 10-cc. portions of 10 per cent trichloracetic acid. One cc. of 6 N hydrochloric acid was added. Hydrolysis of the proteins was effected by autoclaving for 16 hours at a pressure of 20 pounds. One drop of 0.1 per cent phenol red was added, and the hydrochloric acid was neutralized with concentrated ammonia. The volume was adjusted to about 2 cc. The carboxyl groups were then split from the amino acids by reaction with ninhydrin, according to the method recommended by Van Slyke, MacFadyen, and Hamilton (*10*). In this procedure, 50 mg. of powdered citrate buffer at pH 2.5 and 50 mg. of ninhydrin were used. The boiling time allowed was 15 minutes. The carbon dioxide was distilled into 2 cc. of approximately 0.25 N barium hydroxide, and the amount of barium carbonate formed was estimated by titration with 0.1 N hydrochloric acid. After the distillation system had been filled with carbon dioxide-free air, the tubes containing the barium carbonate were removed, stoppered, and set aside for counting.

Measurements of the activity in the carbon dioxide evolved in the ninhydrin reaction were carried out by transferring the gas sample directly into an evacuated counter tube. The gas-counting technique has been recently described (*6*). Such a method is desirable here because the low specific activity of the sample would reduce the efficiency of measurement by standard solid sample—end-window counter techniques to a low value.

The barium carbonate was rinsed into a gas evolution flask attached to the vacuum line. The carbon dioxide was evolved by addition of dilute perchloric acid, swept by a slow stream of nitrogen into a trap cooled in liquid nitrogen, then transferred to a gas burette for measurement of the amount of sample, and finally transferred by distillation to an evacuated counter tube attached to the gas system with ground joint and stopcock. The dose of carbon disulfide vapor necessary for counting was added and the counter tube then detached from the gas system and placed in a lead housing for counting.

A sufficient number of counts was collected in each sample to make the statistical error less than the other errors of tech-

[1] The research described in this paper was supported by Contract N5ori-76 and Contract N5ori-78, U. S. Navy Department. The authors wish to thank J. W. Reese for his assistance in the counting of C^{14}; and Robley D. Evans, Joseph C. Aub, and Paul C. Zamecnik for their advice and encouragement.

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[2] American Cancer Society Fellow.

ique in the over-all procedure. The activities are reported as final corrected counting rates per minute in the samples (*6*).

The data from the first series of experiments are given in Table 1. It may be seen that the incorporation of activity into the trichloracetic acid precipitable protein is a slow and continuing process that is dependent on the utilization of oxygen by the tissue. The low values obtained in nitrogen and after very short incubation periods serve as a check on the efficiency of the washing procedure and demonstrate that this uptake is not a simple adsorption on the protein structure. Presumably because of individual differences between tissue slices, the scatter of the data accumulated to date does not allow the shape of the curve of uptake with time to be determined. It could be expected to go through a maximum and fall toward zero, because the net over-all process is proteolysis.

TABLE 1

No. of slices	Activity added (counts/min.)	Vol. of liquid bathing slices (cc.)	Time	Gas phase	mM CO_2 derived from protein hydrolysate	Total counts/min. incorporated into protein
2	21,000	1.1	1 min.	Air	0.103	12
2	21,000	1.1	1 "	"	0.121	13
2	21,000	1.1	4 hrs.	Nitrogen	0.124	12
2	21,000	1.1	4 "	"	0.091	4
2	21,000	1.1	4 "	"	0.146	0*
4	42,000	2.2	4 "	"	0.147	0
4	42,000	2.2	4 "	"	0.189	20*
2	21,000	1.1	2 "	Oxygen	0.115	102
2	21,000	1.1	2 "	"	0.131	150
2	21,000	1.1	2 "	"	0.112	126
2	21,000	1.1	4 "	"	0.144	916†
2	21,000	1.1	4 "	"	0.125	160
2	21,000	1.1	4 "	"	0.102	166
2	21,000	1.1	4 "	"	0.146	76*
4	42,000	2.2	4 "	"	0.153	188
4	42,000	2.2	4 "	"	0.146	128*

*The pH of the liquid phase in these experiments was 6.96; that in all other experiments, approximately 7.25.

†This value is thought to be greatly in error. It is included in the interest of completeness.

Because of the variety of reactions in which alanine may participate, detection of activity in protein does not prove that alanine molecules, as such, have entered the peptide chain. Preliminary experiments, in which relatively large quantities of nonradioactive *dl*-alanine were added to a tagged hydrolysate and the alanine crystallized three times, do indicate that a large percentage of the activity in the hydrolysate can be accounted for as alanine. Small amounts of activity were found when similar crystallizations were conducted with *l*(+)-glutamic acid and with *dl*-aspartic acid. Whether this activity represents contamination with alanine cannot yet be stated. It would be expected, in the light of the recent work of Anfinsen, *et al.* (*1*) on the incorporation of activity from bicarbonate ion into the glutamic and aspartic acid fraction of protein, that a similar path to these two species would be available by way of pyruvic acid derived from alanine. No activity was found in glycine, the only other fraction so far investigated.

We regard as slight the possibility that activity has been incorporated by transcarboxylation with the original peptide chain, particularly in view of the reappearance of the activity in the alanine fraction. However, this possibility will be investigated with amino acids tagged elsewhere than in the carboxyl group.

Although the pathway by which alanine is incorporated into the proteins of liver slices remains obscure, it seems clear that under the present experimental conditions little or no incorporation is possible in the absence of oxygen. All experiments completed to date confirm this observation. This finding is compatible with theories of protein synthesis which postulate coupling with energy yielding reactions (cf. Lipmann, *4*).

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Isolation of Avian Pneumoencephalitis (Newcastle Disease) Virus From the Yolk Sac of Four-Day-Old Chicks, Embryos, and Infertile Eggs

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Beach (*1*) has reported the isolation of pneumoencephalitis virus from ovarian tissue of a hen, while Jungherr (*2*) and Van Roekel (*3*) have obtained the virus from fresh eggs. These findings show that the virus may be present in hatching eggs but do not provide evidence that it will survive the incubation period and result in chicks being infected when hatched.

In the experiments reported herein, the four-day-old chicks, the embryos, and the infertile eggs used for virus isolation trials were from parent stock known to be affected with pneumoencephalitis. The chicks were hatched from eggs obtained when egg production was severely depressed as a result of pneumoencephalitis. The embryos, from the same parent stock as the chicks, were from eggs collected when the hens were in the recovery period and the rate of egg production was returning to normal. The infertile eggs, from a second flock of breeders, were collected immediately prior to observed clinical evidence of infection, during the outbreak and through the recovery period.

The virus of pneumoencephalitis was isolated by chick embryo culture from the yolk-sac content of 6 four-day-old chicks and from embryos of the succeeding hatch dead on the 15th day of incubation.

Fifty eggs from the second breeding flock were incubated at this laboratory. The virus was isolated from the pooled con-

tents of 13 eggs which were found to be infertile when candled on the 7th day. Twenty live embryos which were sacrificed and 17 chicks which were allowed to hatch were examined without evidence being found that the virus was present. The chicks remained normal during the 21 days they were held for observation, and their sera were negative when tested for hemagglutination-inhibition antibodies.

It is of interest that clinical evidence of pneumoencephalitis infection was not observed in the flock of four-day-old chicks until several days after the 6 birds from which the virus was isolated had been selected. Two additional lots of chicks from the same hatch delivered to other farms were reported to have remained free from infection.

The isolation of pneumoencephalitis virus from the yolk sac of four-day-old chicks, chick embryos, and infertile eggs further emphasizes the possibility that hatching eggs may be a medium of transmission of the disease from breeding hens to their offspring.

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Antibacterial Action of Inactivated Ergosterol in the Guinea Pig and Man

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The antibacterial action, *in vitro*, of ergosterol and related substances has been reported (*3*). Of these substances, vitamin D (activated ergosterol) has found clinical use in tuberculosis and has often caused toxic symptoms (*1*, *2*, *4*).

In guinea pigs we have been able to show that inactivated ergosterol, like vitamin D (activated ergosterol), suppressed tuberculosis; unlike vitamin D, it never caused any toxic symptoms.

Twenty-two guinea pigs infected with virulent tubercle bacilli were injected with 20 mg. of inactivated ergosterol in oil, or 76 mg. vitamin D (viosterol) in oil, and 11 untreated pigs were used as controls. Following the injection of vitamin D up to several days, a change in the appearance of the guinea pigs receiving this substance was noted: their hair stood up, and the animals shivered, had diarrhea, refused food, and lost weight. No such change occurred after inactivated ergosterol injection. The tubercles present on autopsy were fewer in pigs treated with vitamin D than in the others.

In a second trial, infected guinea pigs received a larger dose of inactivated ergosterol (100 mg.) and less vitamin D (15 mg. D_2). These doses were repeated for three consecutive weeks, with untreated pigs as controls. In those receiving vitamin D_2 the changes outlined above occurred after each injection. No such changes were noted after the much larger dose of inactivated ergosterol. On autopsy there was more suppression of the tuberculosis in the guinea pigs treated with the larger doses of inactivated ergosterol than in those receiving smaller doses of vitamin D.

In man, 300–500 mg. of inactivated ergosterol were injected intramuscularly weekly in cases of pulmonary tuberculosis. Four cases treated thus for 6 months showed more improvement than could be expected by bed rest alone; there was retrogression and absorption of the predominantly exudative and productive disease, with conversion of the sputum to negative for tubercle bacilli (except one case with a cavity over 4 cm. in diameter).

The intravenous injection of inactivated ergosterol did not result in an exacerbation or local reaction, as seen after intravenous vitamin D application.

There were never any ill effects after injection of inactivated ergosterol, regardless of the route of injection or the type of lesion treated.

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Prothrombokinase and the Three Stages of Blood Coagulation[1]

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For four decades a two-stage theory of blood coagulation has held sway. Reviews and textbooks have clung to it for lack of agreement among investigators of the problem concerning further detail. But now sufficient unanimity is emerging to justify reformulation of the basic theory.

When plasma is diluted with distilled water and the pH brought between pH 5.0 and 5.5, the resulting euglobulin precipitate contains the essential core of the blood-clotting system. A solution of this euglobulin preparation clots promptly following the addition of ionic calcium. Even in this somewhat simplified form, the coagulation process can be shown to involve three distinct reactions:

(1) Prothrombokinase → Thrombokinase (in the presence of calcium)

(2) Prothrombin → Thrombin (in the presence of thrombokinase and calcium)

(3) Fibrinogen → Fibrin (in the presence of thrombin)

Evidence that blood plasma contains an inactive form of thrombokinase was available as early as 1916 (*2*); and Bordet long ago detected a preliminary reaction occurring before the development of thrombin (*1*). That these important concepts have gained ground so slowly has been due to difficulties both of interpretation and technique. Among the chief of these has been the lack of a satisfactory procedure for studying the activation of prothrombokinase. Progress toward this objective is included in the following preliminary report.

Bovine prothrombin was prepared by a method involving adsorption on magnesium hydroxide, particular care being

[1] This work, done during the tenure of a Life Insurance Medical Research Fellowship, was aided by grants from the James Hudson Brown Memorial Fund and the Fluid Research Fund of the Yale University School of Medicine.

ken to remove prothrombokinase. To prepare prothrombo-nase, bovine euglobulin was heated at 51°C. for 16 minutes remove fibrinogen, most of the prothrombin was then re-oved by two adsorptions with barium sulfate, and finally, ter dilution with distilled water, the prothrombokinase as precipitated at pH 5.2–5.5.

When calcium chloride was added to a mixture of pro-rombokinase and prothrombin, there was a latent period ring which little, if any, thrombin was formed. This was llowed by a period of accelerated thrombin formation. was then shown that the latent period could be eliminated preincubation of the prothrombokinase with calcium and, ntrariwise, that this could not be accomplished by pre-cubation of prothrombin with calcium. This made it evi-nt that the commonly observed latent period was concerned ith the activation of prothrombokinase under the influence calcium.

When thrombokinase so prepared was added to prothrom-n, production of thrombin began not only without a latent riod, but with maximal velocity, and then followed a die-way pattern. The quantity of thrombokinase added to a ven amount of prothrombin determined the initial rate of tivation. These findings are consistent with an enzymatic terpretation. The fact that thrombokinase can be measured the initial rate of prothrombin activation suffices for present rposes.

To follow the activation of prothrombokinase satisfactorily, was necessary to devise a three-stage procedure based on the llowing principles: (I) Calcium was added to prothrombo-nase, and, at intervals, (II) samples were assayed for rombokinase by adding them to tubes of prothrombin. fter a two-minute incubation, in each case, (III) a sample as transferred from the prothrombin tube to a tube of alated fibrinogen.

The speed of coagulation was a measure of the amount of rombin produced during the two-minute incubation, and us of the initial rate of prothrombin activation. In this new ree-stage procedure, it will be noted that the experimental eps correspond directly to the three stages of the theoretical rmulation, and that each of the active factors, thrombo-nase and thrombin, is estimated in terms of its defining roperty.

When the activation of prothrombokinase was plotted gainst time, the experimental points fell close to the theoreti-al curve for an autocatalytic reaction. Moreover, the accelera-ion effected by seeding with a small quantity of activated aterial was striking. When a thrombokinase preparation as heated at 60° C. for 10 minutes, there were drastic losses f both the power to activate prothrombin and the capacity o accelerate the activation of prothrombokinase. Pending urther study and purification of prothrombokinase, the only conclusion drawn is that the activation of prothrombokinase nvolves an autocatalytic or chain reaction.

Further experiments showed that the concentration of alcium was important not only for the activation of pro-hrombokinase but also for the activation of prothrombin. These problems involving the role of calcium in blood coagula-ion and optimal calcium concentrations require further nvestigation.

As is well known, certain plasma derivatives which have been treated to develop their fibrinolytic capacity are also able to hasten the activation of prothrombin. However, Seegers and Loomis (*7*) obtained a fibrinolytic preparation which did not activate prothrombin. It can now be reported that active thrombokinase preparations failed to cause obvious fibrinolysis in 12 hours, although a control fibrinolysin preparation produced lysis in 5 minutes. Thus, thrombokinase and fibrinolysin (plasmin) appear to be distinct; however, further inquiry is desirable.

Prothrombokinase is not a new coagulation factor. Since the early work of Dale and Walpole several investigators have recognized its existence in plasma and have called it "prothrombokinase" or by a recognizably similar name. "Factor V" well could be included, although interpreted differently by Owren (*5*). In addition to this, prothrombokinase is undoubtedly a component of several diversely-named "blood-clotting factors" which have been independently disclosed in a variety of ways. The three-stage formulation has been implicit in the contributions of many workers and, in principle, is becoming more widely accepted (*3–6, 8*). Now that a direct three-stage method of analysis is available, it should be possible to decide whether a coagulant preparation contains prothrombokinase or thrombokinase. If this is not the fact, it should be possible to determine whether it accelerates the activation of prothrombokinase or favorably conditions the activity of thrombokinase.

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Growth *in Vitro* of Immature *Hordeum* Embryos[1]

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Experiments on the cultivation of immature plant embryos *in vitro* have met with varying success, depending on the age of the embryos used as well as on the species chosen. Most workers have found that only embryos already differentiated to some degree are able to grow on artificial media. Furthermore, in the case of older embryos, it has been observed by La Rue (*1*), working with *Zea* and *Avena*, and by others, that the plants obtained from excised embryos are smaller and weaker than those from mature seeds. This phenomenon appears to be related to the fact that an embryo removed from the seed and placed on nutrient agar tends to germinate immediately to produce a miniature seedling, rather than to continue the characteristic development leading to a fully grown embryo. Thus, the problem of growing young embryos appears to involve two interrelated questions: (1) how may the growth of young embryos be promoted, and (2) how may one

[1] Paper No. 371 from the Department of Genetics, College of Agriculture, University of Wisconsin.

bring about a continuation of the embryonic type of growth? It is with the latter aspect that this paper is particularly concerned.

Barley (*Hordeum vulgare* var. *Chevron*) is used as the experimental material in most of the studies. Greenhouse-grown plants provide the seeds from which embryos are aseptically removed. The basic medium contains distilled water, 2 per cent sucrose, 0.8 per cent agar, and the mixture of minerals used by Randolph and Cox (*2*). The pH of this medium is about 5.6; all of the supplemented media are adjusted with KOH and HCl to approximately the same pH. The cultures are kept in the laboratory at room temperature.

Immature embryos (about 10–15 days after pollination), when placed on the basic medium, regularly germinate within 2 or 3 days, forming seedlings of a normal appearance except for being smaller and more spindling than those from mature seeds; the younger the excised embryo, the weaker is the seedling. The transformation from embryo to seedling also finds expression in the percentage of dry matter: an embryo growing in the seed consists of about 40 per cent dry matter, whereas during 5 days on the basic medium the dry matter content of the seedling drops to about 10 per cent.

TABLE 1

GROWTH OF BARLEY EMBRYOS ON MEDIA CONTAINING VARYING AMOUNTS OF CASEIN HYDROLYSATE

Treatment	No. of embryos	Avg. wet wt. (% of control)	Avg. dry wt. (% of control)	Avg. dry matter (% of wet wt.)
Untreated				
Removed from plant at start of experiment	6	4	17	35
Removed from plant after 5 days	12	9	39	39
Grown *in vitro* for 5 days				
Casein hydrolysate (%)				
0 (control)	11	100	100	10
½	10	141	147	10
¼	10	169	219	11
½	11	145	264	18
1	12	69	178	25
2	12*	21	95	36

* Four of this group died without appreciable growth.

The prolongation of embryonic growth (enlargement of the scutellum and continued development of the root and leaf primordia within their embryonic sheaths) may be brought about by addition to the basic medium of an "embryo factor" found, for instance, in casein hydrolysate. On a medium containing 1 per cent of vitamin-free acid hydrolysate of casein, germination is inhibited for several days in the case of embryos about 13–15 days old; the germination of 10- to 12-day embryos is delayed for longer and sometimes indefinitely. The embryos meanwhile undergo considerable enlargement so that sometimes their size exceeds that of normal, mature embryos. Lower concentrations of casein hydrolysate give correspondingly lessened effects. Table 1 shows the results of a typical experiment.

It can be seen from Table 1 that (1) all but the highest concentrations of casein hydrolysate increase both the wet and the dry weights relative to the control; (2) with the higher concentrations the dry weight increase is relatively greater than the wet weight increase, thus giving a steady increase in the p centage of dry matter; (3) in all cases the embryos grown *vitro* weigh more (wet *and* dry) than the original embryos at t start; and (4) the artificially cultivated embryos are heav than they would have been had they been left to grow on t plant for the same period.

Results of the same general nature may be obtained using water extracts of dates and bananas, wheat gluten h drolysate, lactalbumin hydrolysate, milk, and especially mato juice. The tomato juice may be prepared by minci fresh, ripe tomatoes (e.g. in a Waring Blendor), centrifugi and filtering the product, autoclaving the filtrate, and th refiltering to remove the precipitate which forms the fi time the juice is autoclaved. Thereafter the juice is apparen unaffected by repeated heating. Attention is called to t source of embryo factor in particular because of its clear-c effect not only on the 10- to 15-day embryos but also on tho several days younger. Embryos 7–9 days old at excision sho very irregular growth on the basic medium, varying from observable change to weak germination, with occasion callus growth; however, when placed on a medium which h been made with one-third to two-thirds of the water replac by tomato juice, these young embryos regularly enlarge in fashion resembling normal embryo growth. A suggestion th this growth bears a physiological as well as morphological semblance to normal growth is found in the fact that if embryo is removed from the supplemented medium with about 2 weeks or less, germination soon occurs and the seedli formed is much stronger than one which has grown co tinuously on the basic medium. The growth rate after remov is so much greater than that of a control embryo that this la ter is soon overtaken by the tomato-fed plant. In some case young embryos showing no growth on the basic medium ma be induced by this method to form small seedlings.

Growth, particularly of the younger embryos (7–9 days was also favored by the addition of sodium nucleate fro yeast. The preparation which gave the best results was ob from the Schwartz Laboratories, Inc., New York City. It wa effective in concentrations from 2 per cent to at least as lo as .25 per cent. It had no germination inhibiting effect, bu produced stronger seedling growth. As with tomato juice, supported the growth of embryos too young to survive on th basic medium. In one typical experiment in which length o shoot was used as a measure of growth, and the height of th control seedlings was taken as 100 per cent, the average valu for 19 embryos grown on a medium supplemented with 1 pe cent sodium nucleate was 210 per cent.

Little can yet be said regarding the nature of the ingredient which are active in promoting embryonic growth. One que tion for further investigation immediately presents itself: the embryo factor one substance causing an all-over morph genetic effect, or is it, e.g. in the tomato juice, a combinatio of two factors, one of which inhibits germination, the othe promoting growth of the young organism? In either case, th temporary maintenance of the embryonic type of growth b the addition of the substances discussed appears to be o importance in rearing strong plants from immature embryo

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N THE LABORATORY

imple Technic for Passage Certain Viruses[1]

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n making a passage of a virus, the usual technic is to tri-te an organ or tissue of an infected animal using a mortar, le, and abrasive. The ground tissue is suspended in a suit- diluent, centrifuged, and the supernatant used to subinocu- other animals. This procedure requires considerable ster- equipment and is time consuming. The purpose of this rt is to describe a simplified method which has proved to f value in subinoculating the viruses of St. Louis and Japa- encephalitis from the brains of experimentally infected e and hamsters. The method is similar to that used to ob- specimens for culture of bacteriologically infected tissues, aspiration of buboes, and for microscopic examination of cted tissues, e.g. examination of biopsied brain tissue for erythrocytic stages of malarial parasites (*1*).

The technic consists merely of inserting a hypodermic dle, attached to a small syringe, through the disinfected , calveria, and into the cerebrum of the animal from which desires to make the transfer, applying moderate suction h the attached syringe, and then inserting the contaminated dle intracerebrally in the same manner into a recipient se. The only equipment needed is the sterile syringe and dle. When more than one animal is subinoculated, the dle is reinserted into the "donor" cerebrum before each inoculation.

Since the brains of mice infected with either of the viruses have used (Hubbard strain of St. Louis encephalitis; kayama strain of Japanese encephalitis) are consistently ctious for mice in dilutions of 10^{-7} to 10^{-8} or higher, the hnic described probably carries over many infectious units m an animal with a full-blown infection. In order to test the thod a hypodermic needle was contaminated with St. Louis cephalitis virus by dipping it into a 10^{-1} dilution of infected in emulsion. The needle was then inserted into the cere- m of a mouse and withdrawn. Eight mice were inoculated this way. All died with typical signs of St. Louis encepha- s.

Seven other mice were inoculated intracerebrally with a dle which had been contaminated with Japanese encepha- s virus by inserting it into the cerebrum of a mouse which d just died of an infection with that virus. All died with pical symptoms.

The success of the method is probably, in great part, de- ndent upon the presence of a high concentration of the in- tious agent in the tissue to be subinoculated and a high gree of susceptibility of the animals used. We have tried the method with the Lansing mouse-adapted strain of poliomyelitis virus with little success. Subinoculations to 3 mice were made by this method from each of 9 mice paralyzed after intracerebral inoculation. The incubation period in the donor mice was 5 days or less, during which period the virus is present in the brain in the greatest concentration (*2*). In only two instances did the subinoculated mice develop poliomyelitis (one of three mice in each case) in a 21-day observation period. The failure of the method here was probably due to the relatively low concentration of virus present in the donor brains.

This technic may be used either with living or dead mice, but we have found its greatest use to be in the situation where a mouse is found dead without previously having shown signs of illness, or having shown indefinite signs. In attempts to isolate the encephalitis viruses from a variety of neural and extraneural tissues of infected hamsters (*3*), mice were injected intracerebrally with tissue emulsions in the usual manner. The tissue specimens were occasionally contaminated with bacteria or contained minimal amounts of virus, or both. Many mice died without showing typical signs of viral encephalitis, with obvious bacterial encephalitis, or after prolonged incubation periods. A passage from such mice was desirable in order to assist in the interpretation of the result, and the technic described proved to be advantageous in making such passages.

To date, a total of 171 successful passages of virus have been made with this technic from the brains of mice dying after intracerebral inoculation with various hamster tissue emulsions and from those of hamsters following intracerebral or extraneural inoculation. In 87 of the 171 instances the donor animal died without typical signs of viral encephalitis having been seen, although observations were made at least once a day. In these 87 instances it would not have been possible to establish the cause of death without passage. In 13 of the successful passages the subinoculations were done from animals showing signs of bacterial infection of the brain, resulting from a bacterially contaminated inoculum. The usual method of emulsifying the brain tissue mixes any bacteria present into the whole preparation and renders a bacteria-free passage inoculum impossible without careful centrifugation, filtration, or some other manipulation. The method described is particularly useful in such cases because one can avoid the usual localized abscess in the cerebrum by inserting the transfer needle into the opposite hemisphere from the original inoculation.

The technic described here has the advantage of simplicity and speed, and has proven of value in the application mentioned. It should be applicable to other viruses, or other infectious agents, that occur in tissues in high concentration.

[1] Aided by a grant from the National Foundation for Infantile Paralysis, .

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A Method for Permanent Identification of Materials Sealed in Small Containers

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Bacterial cultures, viruses, bacteriophages, and other materials which might be dried and sealed in small containers under the original vacuum are frequently kept for months or years before use. Methods commonly used for identification of such tubes, frequently only 7–10 mm. in diameter, are unsatisfactory. Gummed-paper labels are defaced or soak off during the customary preliminary freezing. If a spiral strip of paper is used, the contents of the tube may not be readily visible for inspection. Paper labels of any type are likely to become dry and frequently fall off during prolonged storage under varying conditions of humidity; furthermore, they are subjected to the attentions of the cockroaches and silverfish which are too frequently present in many laboratories. Adhesive tape is awkward to handle and difficult to write on. Scotch tape protects labels to some extent, but eventually dries. Writing on the container itself with wax pencil is impermanent, while the use of a diamond point introduces the possibility of weakening the glass. Most small containers do not afford sufficient area to permit inscribing adequate data.

Introduction of a marker into the tube before use is more satisfactory. Permanent identification can be afforded by colored "seed" glass beads now available at 5- and 10-cent stores. These beads, about 2 mm. in diameter and 1 mm. in height, can be obtained for about 15 cents per vial containing approximately 1,000 beads. Ten clearly differentiated colors are sold.

The beads are made of colored glass and do not change color after being subjected to autoclaving or treatment in the hot-air sterilizer. No toxic effect has been apparent. They can be introduced into the tube and sterilized with it or can be sterilized separately and put into the tube with aseptic precautions. The colors are readily visible after the culture or other material has been dried in the usual amounts.

A standard code for identification of cultures dried by lyophile, cryochem, or other processes would permit exchange of materials between laboratories and ready identification. By a suggested system, now in use, a single bead is assigned to each of the major groups as follows: red, *Clostridium*; purple, *Corynebacterium*; green, *Hemophilus*; blue, *Neisseria*; white, *Pasteurella*; yellow, *Salmonella*; brown, *Shigella*; black, *Streptococcus*; gold, bacteriophage; and silver, virus. Forty-five additional generic combinations can be made by using two beads, each of different color. The use of an indicator code for each genus reduces records to a minimum, permits rapid recognition, and will simplify correspondence.

Amplifying this system, the species is represented by two beads of the same color. With a single genus indicator bead, 10 species can be identified, using a total of three beads per tube. An additional 10 species can be identified by using three similarly colored beads with the single genus indicator color. When this possibility is exhausted, the number of combinations becomes greatly increased, since the addition of four beads to the genus indicator permits the possibility of representing the species by pairs differing in color from each other. If the genus is represented by two single beads of different colors, the 8 remaining colors are available for use in sets of two or m similarly colored beads to represent species. Beads differing shape from those described are also available, permittin large number of additional combinations.

The method is inexpensive, simple, and permanent. It readily be adapted to materials other than those used by bacteriologist. The use of larger beads would permit a perm nent identification of materials dried in containers larger t those customarily used for bacterial cultures. The possibil of using beads of different size or shape to expand the cod include data on lot number, date, and other information be apparent.

A Modified Warburg Vessel[1]

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The present method of introducing various substances i the main reaction mixture of a Warburg vessel has cert drawbacks. The usual method of transferring the contents the side arm involves removing the manometer from the wa bath, which inevitably causes temperature changes in system. The contamination by KOH from the center well m also occur, and when 10 or more manometers are used in t same experiment, the procedure may take several minutes.

In order to eliminate these difficulties, the flask illustrat in Fig. 1 was constructed. In this flask the side arms are i serted in the main vessel by means of ground-glass joints a

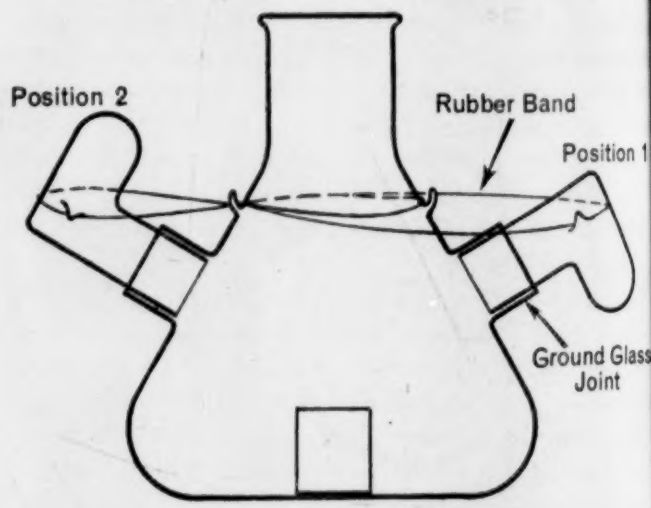

FIG. 1

are attached with rubber bands. At the beginning of the e periment the side arms are placed in position 1. After tempera ture equilibrium has been reached, they may be turned t position 2 at any moment. The rubber band keeps the sid arms fixed in either position.

This modified Warburg vessel enables one to add one or tw substances to the main reaction mixture at any time during th experiment. The addition can be carried out quantitativel within a few seconds and without causing any temperatur changes. The modified vessel may be used also for chemica microanalyses in which the determination of certain substance is based on gas reactions.

[1] Aided by a grant from the Medical Science Section, Office of Nava Research, Navy Department.

Ureteral Catheter for Microinjection Tubing

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In the usual arrangement for microinjection with the Chambers or Fitz micromanipulators, the syringe is connected to the needle holder by fine metal tubing (*1*). This tubing works satisfactorily during the actual injection, where the amplitude of movement is small, but is subject to fairly frequent breakage during the greater flexions which occur in cleaning, filling, and adjusting the apparatus. When the microinjection apparatus is used separately from the micromanipulator, as it has been in many investigations involving semimicrotransplantation (*2*), or injection of materials into insects or embryos, the frequency of breakage is increased. In addition, the not inconsiderable mechanical resistance offered by the metal tubing interferes markedly with the delicacy of manual operation which can be attained. These obstacles are still more troublesome with a glass capillary connector (*3*). Furthermore, suitable metal tubing is difficult to obtain and repair and is expensive.

We find that the above difficulties can be overcome completely by substituting ureteral catheter tubing for the metal or glass connector. This type of catheter, which is made of plastic-impregnated nylon, is inexpensive and, though extremely flexible, is very resistant to pressure, stretching, kinking, and breakage.[1] Moreover, snug connections to both syringe and needle holder can be made very simply by way of No. 24 hypodermic needles (with the points cut off square and smoothed), providing the basal end of the needle holder is turned down to the standard taper of the hypodermic needle hub.

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Improving the Performance of the Flame Photometer

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The following modifications of the Model 18 Flame Photometer (manufactured by the Perkin-Elmer Corporation) have been necessary to bring the performance of the instrument up to an excellent degree of precision and reliability.

The flame characteristics were improved by placing a Bunsen burner inside the original Meeker burner and permanently removing the grid on top of the latter. The installation requires no machining of any kind (Fig. 1). The alteration resulted in a more steady flame with both bottled and Ohio natural gas, irrespective of the gas-jet size.

[1] Size "French 4" ureteral catheter, American Cystoscope Makers, Inc., 1241 Lafayette Avenue, New York City. These catheters are approximately 65 cm. long, 1.35 mm. o.d., and 0.5 mm. i.d.

Additional improvement was obtained by placing an ordinary 250-watt infrared lamp facing the right side of the photometer. The bulb serves to warm the air entering the atomizer by heating an improvized air filter and also warms

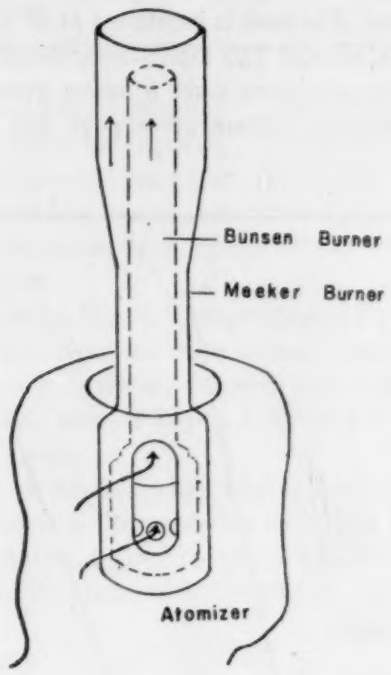

FIG. 1

the atomizer directly, as the door to its compartment is held permanently open. The increase in temperature permits a more rapid attainment of equilibrium within the vessel because of a greater degree of vaporization and a reduction in the excess condensation on the walls of the atomizer.

A Sensitive Cylinder-Plate Assay for Bacitracin

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A cylinder-plate assay is desirable for practically any type of antibiotic work because it is not readily disturbed by slight bacterial contamination, it readily reduces to routine handling by technicians, and it is less time consuming than other assays.

The assay of bacitracin previously described by Johnson, *et al.* (*2*) was a 72-hour dilution assay using *Streptococcus hemolyticus* (Chanin strain). For our preliminary research work on bacitracin, *Staphylococcus aureus* was used as a cylinder-plate assay organism, but its relative insensitivity and rather "fuzzy-edged" zones limited its usefulness.

During the examination of the spectrum of bacitracin four rather sensitive organisms were found which gave good growth on a plate: *Micrococcus flavus*, isolated from the laboratory air; *Gaffkya tetragena* ATCC #6007; *Sarcina flava* ATCC #540; and *Sarcina lutea* ATCC #272. Experiments using each one of these organisms showed *M. flavus* to be superior because of the smoothness of growth and sharp, even edges of the inhibition zones.

The assay as finally developed uses *M. flavus*[1] as the assay organism; a culture of this has been sent to the American Type Culture Collection (ATCC #10240). The inoculum is developed by inoculating 60 ml. of "Bacto Yeast Beef Broth"[2] (*1, 3*) in a 300-ml. Erlenmeyer flask by means of a loop from an agar slant culture. The flask is incubated at 37°C. while being shaken on a machine at 126 oscillations/minute with a 1½-inch stroke. This procedure gives a heavy growth of organisms; static inoculum culture gives poor and grainy plate growth.

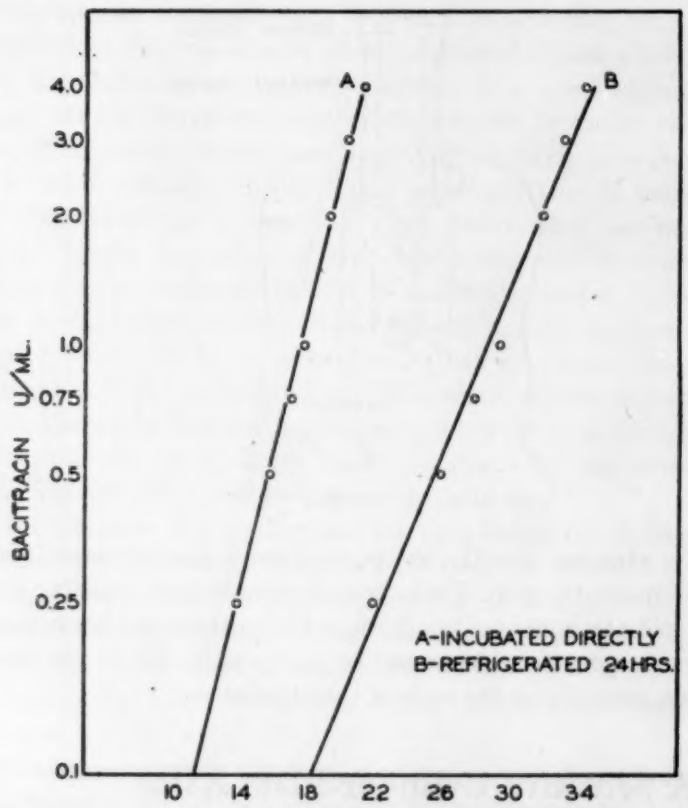

FIG. 1. Response of *M. flavus* to graduated doses of bacitracin on a cylinder-plate assay procedure: A, response curve when plates are incubated at 37°C. immediately after dosing; B, response curve when plates are held in refrigerator 24 hours before incubating at 37°C.

Plates are poured aseptically in the morning, using a Brewer Automatic Pipetting Machine, with 20 ml. of "Bacto Penassay Seed Agar"[3] (*3*). By this method a large number of plates can be rapidly and accurately poured.

In the afternoon the seed layer is poured, using the same kind of agar as the base layer, inoculated with 1 per cent of the 18-hour inoculum broth. Four ml. of seeded agar at 50°C. is used per plate, and the plate rapidly tipped to distribute the layer evenly. Stainless-steel cylinders are placed with a dispenser (made by Robert D. Shaw, Bloomfield, Connecticut) after the agar has gelled but before it has become very hard (15–20 minutes after pouring).

The cylinders are filled with the sample, diluted to approximately 2 units/ml. with sterile, 1 per cent phosphate buffer[4] of pH 6.5. Two cylinders on each plate are filled with a stan bacitracin solution of 2 units/ml., and two cylinders on same plate are filled with the unknown solution, after w the plates are covered with "Coors" porous porcelain co not raised. The plates are incubated directly at 37°C. 16–18 hours. The zones of inhibition are then read by pro ing the image of the plate onto a screen by means of an o head-type lantern-slide projector. The screen is ruled, and diameters of the inhibition zones are read and recorded. units/ml. for each sample are then calculated on a slide constructed from a standard curve prepared previously plotting on semilog paper averages of 100 readings/do level, 0.1–4 units/ml. (Fig. 1). That the day-to-day varia on the curve is not usually excessive is demonstrated Table 1. The variation when responses with different bat of media are compared may be slightly greater.

TABLE 1

DAY-TO-DAY RESPONSE OF *Micrococcus flavus* TO BACITRACIN

	Average diameter of zone of inhibition i				
	0.1 u./ml.	0.5 u./ml.	1.0 u./ml.	2.0 u./ml.	4.0 m
1st day	11.3	16.2	17.7	19.3	21
2nd "	11.6	16.1	18.1	19.4	21
3rd "	11.2	16.3	17.9	19.3	21
Average	11.3	16.2	17.9	19.3	21

The slope of the curve is less than for penicillin, since t is approximately a 1.7- to 1.9-mm. increase in zone size doubling of dose. This slope can be increased to 3.0 or be by refrigeration of the dosed plates 16–18 hours before incu tion. The precision of the assay is not greatly increased, h ever, because the variation of zone diameters increases. T penicillin curve gives a slope of 3.2 without refrigeration. T difference in slope is a reflection of the relative speeds of di sion of the two substances, the refrigeration procedure giv bacitracin a greater time for diffusion. For results in wh reasonably high significance is needed, 4 plates (*i.e.* 8 zon are averaged to give the assay; for final lots for clinical use plates are used.

The assay can be used for blood serum assays. Dilutio made up in fresh rabbit serum and in horse serum gave val within 10 per cent of the known. Attempts to extend the ra of the assay below 0.1 unit/ml. by preliminary refrigerati have not given reliable results.

Common organic solvents used in recovery, such as butan ether, ethanol, etc., do not interfere with the assay when luted 1/20 or greater. Bacterial contamination, unless exc sive, does not interfere; bacitracin beer samples, for instan are simply centrifuged for 20 minutes at 2,000 × g, wh reduces the bacterial population in the supernatant sufficien to allow a satisfactory assay.

[1] Identified by Robert S. Breed at the New York State Agricultural Experiment Station, Geneva, New York.

[2] Medium II of Schmidt and Moyer (*3*) as reported by Food and Drug Administration (*1*); manufactured by Difco Laboratories, Detroit, Michigan.

[3] Medium I of Schmidt and Moyer (*3*) as modified by Food and Drug Administration (*1*); manufactured by Difco Laboratories, Detroit, Michigan.

[4] The composition of the buffer is: K_2HPO_4, 4.43 grams; KH_2PO_4, 5.57 grams; distilled water to 1 l.

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2. JOHNSON, BALBINA A., ANKER, HERBERT, and MELENEY, FRANK *Science*, 1945, 102, 376–377.
3. SCHMIDT, WILLIAM H., and MOYER, ANDREW J. *J. Bact.*, 1944, 47, 1 208.

Book Reviews

hes of the Pacific Coast of Canada. Wilbert A. Clemens nd G. van Wilby. (Bull. LXVIII.) Ottawa: Fisheries Research Board, 1946. Pp. 368. (Illustrated.) Paper, $1.50; loth, $2.00.

For most of the seas of the world there are no comprehensive ks on fishes which are useful to both ichthyologists and specialists. The present volume fills that need for one large an area. Every species of fish which has been reported from west coast of Canada is included. The fish fauna of the rtheast Pacific is so homogeneous, however, that the book l be most useful to anyone interested in the fishes which ur between Monterey Bay, California, and the Aleutian nds, Alaska.

Identification keys for all of the species are included. There a well-done, full-length illustration of each kind of fish, wly prepared by F. L. Beebe. Each species is adequately deribed in the test, and such information as is available about life history and habits is briefly noted. There is an extensive ssary of the descriptive terms used, which will be useful to specialists who are consulting other fish books. A bibliogray of scientific papers on British Columbia fishes is given, lowed by a list of general reference books on fish.

The work presented in the book is based on years of field perience with the forms described and is of high quality from ichthyological standpoint. The system of classification opted is modern, but on the conservative side and with tle attention paid to taxonomic categories below the species vel.

W. M. CHAPMAN

niversity of Washington, Seattle

hat is psychology? Werner Wolff. New York: Grune & Stratton, 1947. Pp. xii + 410. (Illustrated.) $4.00.

Although the chapter headings in this book are similar to ose found in most general psychology texts, the topics disssed and the data presented are evaluated from the "ornismic" point of view which ". . . considers man's behavior ot as a fixed arrangement but as a dynamic system; the total ehavior is more than the sum of its parts, a directing center ing the resultant of functional relationships." In view of the uthor's theoretical bias it is not surprising that the researches resented in greatest detail are those done in his laboratory s well as in those of other gestaltists. One may wonder if the rst-year student reading this book will come away with the mpression that the problems with which gestaltists concern hemselves are peculiar to that approach alone.

If, as the author states, the aim of this book is to make the tudent aware of the need for a questioning attitude, might it ot be advisable to start with a study of the way in which we se words in questioning, formulating, and analyzing a statenent? For example, in his discussion of perception Wolff says: "How can we unite the opposite theses that things actually are s they basically look to us, and that things are not as they look but reflect our imagination?" The reviewer is puzzled by what Wolff means by "actually," "basically," "reflect," etc. Are we referring to the same phenomena when we use the same words? It should be noted that neglect of the study of the function of language is a characteristic of practically all psychology texts.

The chapters on Depth Psychology and Personality present the data in these areas in a more rounded fashion than do most psychology texts; however, devoting two and a half pages to "techniques and aims of Depth Psychology" is likely to give a distorted picture.

The first-year student will probably find this book interesting and stimulating. Representing as it does a particular theoretical orientation in psychology, it should be used in conjunction with other texts with different approaches.

SEYMOUR B. SARASON

Yale University

Guide to the literature of mathematics and physics including related works in engineering science. Nathan Grier Parke, III. New York-London: McGraw-Hill, 1947. Pp. xv + 205. $5.00.

Despite the fact that mathematics, physics, and their applications in engineering are among the oldest of the sciences, their voluminous literature has been, and still is, difficult to get at. The student of these sciences, beginner and specialist alike, and the librarian who, except in rare cases, is not acquainted with these subjects have long needed a guide to publications in these fields. This need has now been admirably met by Nathan Grier Parke, III, of the Massachusetts Institute of Technology. As a matter of fact, useful as this work will be to the expert, it will prove a real boon to that fast-growing army of workers in other sciences who must use mathematics and physics as tools in their own work.

The book begins with a chapter on the principles of reading and study which is followed by chapters on self-directed education, how to conduct a literature search, and how to use periodicals. The directions given are clear and concise, and the reviewer feels that, based upon his experience in the Reference Department of the world's greatest library, even specialists in the physical sciences will profit from reading the first half of Prof. Parke's guide.

In the second half of his book, roughly more than half the volume, the author presents a list of some 1,800 works in mathematics, physics, and related subjects representing, in fact, a carefully selected library in these subjects. Indeed, about half the titles are represented in Dr. Parke's personal library, while the rest were selected from a study of review journals and catalogues and by checking the reference shelves of such collections as those at Johns Hopkins, M.I.T., and the Library of Congress. Not only standard works in English, but also many in French, Italian, and German are listed.

Preceding the list of titles is a classification of the subject matter of the text. The references, however, are arranged under

an alphabetical list of subject headings which, while it does permit of indefinite expansion, does not bring all relevant material together. In fact, it is not quite clear why Dr. Parke, having constructed a classification, did not use it, simply adding an alphabetic relative index as a key. Access to the titles by author is provided through an author index.

The book on the whole is well produced although the use of lower-case type for the subject headings is somewhat annoying.

As a librarian I am grateful to Dr. Parke for his valuable guide. I believe that all who use his book will express a similar sentiment.

MORRIS C. LEIKIND
Library of Congress, Washington, D. C.

Dynamic aspects of biochemistry. Ernest Baldwin. New York: Macmillan; Cambridge, Engl.: at the Univ. Press, 1947. Pp. xviii + 457. $4.00.

The author has devoted this text to enzymes (5 chapters) and metabolism (11 chapters).

The chapters on enzymes cover this field very well. Groups of enzymes are discussed which usually receive little attention. One could wish that the author had summarized all the chapters as was done in the case of the first two.

In the chapters on metabolism, the role of individual amino acids is featured. In the opinion of the author the end-product of nitrogenous metabolism is based on the availability of water to the organism. Emphasis is placed on adenosine triphosphate as the only source of energy that can be directly utilized by living organisms.

The close resemblance of the carbohydrate metabolism of yeast and muscle is discussed.

The author has accepted as fact that virus proteins can "reproduce." So far as one of these proteins is concerned, it has been shown that it can be "sterilized" by appropriate means without loss of any of its physicochemical properties.

The text is well written, in simple, clear language and should be a requirement for every graduate student in the field of biological chemistry.

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Scientific Book Register

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